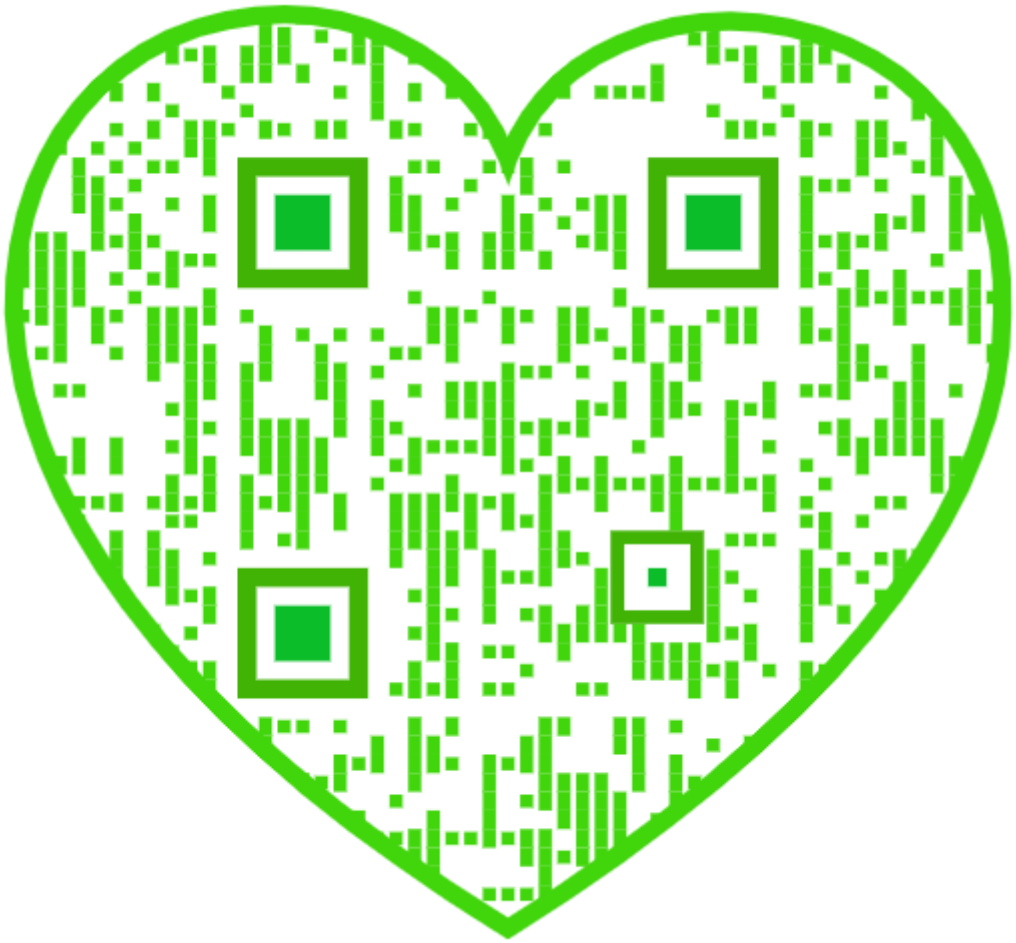

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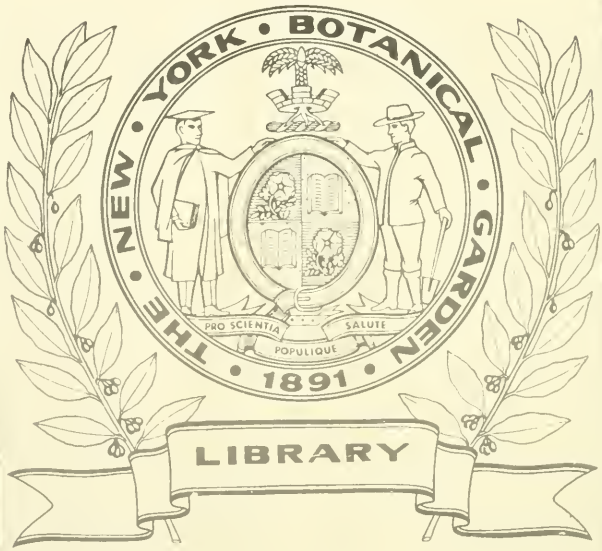

ERYTHEA

A JOURNAL OF BOTANY, WEST AMERICAN AND GENERAL

EDITED BY

WILLIS LINN JEPSON,

ASSISTANT PROFESSOR OF BOTANY IN THE UNIVERSITY OF CALIFORNIA

VOLUME VII

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ERYTHEA

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ERYTHEA

A MONTHLY journal of Botany, West American and general, devoted to every department of botanical investigation and criticism.

While the articles on the general and special morphology, classification and geographical distribution of Pacific Coast plants impart to the journal a West American character, papers of a more general nature will constantly be given place. Not the least interesting feature of the issues are the short articles, news notes, open letters and comments on current literature.

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NEW SPECIES OF PLANTS FROM MEXICO.

By T. S. Brandegee.

The following species are described mainly from a collection made by Mr. A. W. Anthony during the spring of 1897. All the islands off the west coast of Lower California were visited by him, those whose flora had already been collected, as well as others botanically unexplored. A landing was made at San Bartolomé Bay and other coast localities, including San José del Cabo. I accompanied the expedition to the latter place and then returned, while Mr. Anthony visited the Revillagigedo group of islands 250 miles further south. This group consists of Socorro, Clarion, and San Benedicto, and the only knowledge of their flora had been obtained from a small collection made by the Albatross in 1889.* Mr. Anthony's collections have added many species to the previously known flora of these islands and also to that of the better-known Cedros, Guadaloupe, and San Benito Islands. The coast from San Bartolomé to below Magdalena Bay was dry as a drought of two years' duration could make it, and consequently only a small collection was made from this part of the Peninsula, but something was learned concerning the distribution of plants until then supposed to be insular. During the return trip many localities were revisited and plants flowering later in the season were collected.

A great deal of credit is due to Mr. A. L. Stockton, who collected most of the specimens and dried them in a small schooner under unfavorable conditions of climate. A few of the following new species are from collections made by Dr. C. A. Purpus in the spring of 1898, about Santo Domingo, Calmalli and San Pablo of Central Lower California, and some were collected by myself in various trips into Baja California.

Triumfetta Socorrensis. Frutescent, densely stellate-tomentose: leaves cordate, broadly ovate, acuminate, 4–6 cm. long and nearly as broad, on petioles 2 cm. long or less, whiter and more

AUG 7 - 1923

*Proc. U. S. National Museum, Vol. xiii, p. 145.

densely stellate tomentose beneath, serrate or dentate, sometimes indistinctly 3-lobed: flowers on short axillary peduncles; sepals 6–7 mm. long, linear, mucronate; petals oblanceolate, shorter than the calyx; stamens 20: fruit 3-seeded, 3-celled, tomentose, 5 mm. long, armed with 12–20 hooked spines 6–7 mm. long.

A handsome shrub growing upon Socorro Island. Anthony's No. 378.

Dalea Purpusi. An intricately branched shrub 3–4 dm. high; stems glabrous, slightly glandular dotted; leaflets 3–5 narrowly or broadly obovate, obtuse or retuse, cuneate at base, 4–6 mm. long, 3 mm. wide, black glandular dotted below, silky pubescent: spikes broadly ovate, 15 mm. long, about 12-flowered; bracts soon deciduous ovate-lanceolate, 5–6 mm. long, equaling the flower buds, sparingly glandular, silky pubescent and densely long ciliate on the margins, especially near the base; calyx silky-hairy, dotted with yellow glands between the prominent ribs, teeth linear, 8 mm. long, twice the length of the tube, plumose; petals pink or rose color, keel and wings 5 mm. long, with claws of nearly the same length, standard round-cordate, 3 mm. wide; pod silky pubescent and plumose along the dorsal margin and lower part of the style, glandular dotted, 1-seeded; stamens 10.

Plants with fruit and old flowers were collected by the writer in 1889, at San Estaban, Baja California, and by Dr. C. A. Purpus, in March, 1898, near Calmalli, not quite in bloom. In Proc. Cal. Acad., ser. 2, vol. ii, 147, it was referred to *D. formosa* Torr., which species in general appearance it much resembles.

Dalea Anthonyi. Frutescent, erect-spreading, growing in dense clumps one meter in height and diameter, glabrous excepting a few silky hairs about the calyx teeth and midrib of the leaf; leaflets 6–10 pairs, 3–4 mm. long, oblong, obtuse, glandular below and on the margins; stipules setaceous; peduncles much longer than the leaves: heads rather densely flowered, 5–6 cm. long; bracts longer than the calyx; calyx 3–4 mm. long, glandular between the prominent ribs, teeth triangular, acute, the lower much longer, equaling the body of the calyx: corolla violet, standard one-third longer than the calyx, wings twice as long, keel three times as long; pods, 1-seeded, smooth, longer than the calyx.

Common about San José del Cabo, the finest plants growing in

large clumps on the "sandwash" along the river. Although nearly related to *D. Parryi* T. & G. and especially to *D. divaricata* Benth. it seems to be specifically distinct. From *D. divaricata* it is easily distinguished by its acuminate calyx teeth, its more numerous glands, larger leaves, and more robust erect habit. It is No. 129, Proc. Cal. Acad., ser. 2, vol. iii, 126. Anthony's No. 352.

Vernonia littoralis. Frutescent; stems brown, striate, slightly pubescent, more so above; leaves ovate-acuminate, abrupt or cuneate at base, denticulate with excurrent veinlets, slightly pubescent, 4–8 cm. long, 3–5 cm. wide on petioles 1–2 cm. long; inflorescence axillary and terminal, the axillary corymbs as long as the leaves and bearing a few small leaves; heads 7 mm. high on pedicels of the same length or shorter, 7-flowered; involucre broadly turbinate; scales imbricated, the lower minute, the succeeding ones ovate-acuminate, the upper linear, obtuse, all ciliate-pubescent, chartaceous, with an evident mid-nerve; tube of the corolla slender, ampliate above; pappus double, the outer copious, of very narrow paleæ nearly the length of the 2½-mm.-long akene, the inner 4–5 times longer; akenes broadly turbinate, smooth, obtusely 4-angled with several more or less indistinct intermediate ones.

Collected on Socorro Island by A. W. Anthony not in sufficient quantity for distribution.

Eupatorium Purpusi. Herbaceous, 4–5 dm. high, glabrous except a slight pubescence on the upper part of the stems; leaves opposite, 3-nerved at base, membranaceous, ovate, sometimes cordate, sometimes truncate at base, glabrous, crenate-serrate, acuminate, the largest 4–6 cm. wide, 9–12 cm. long, including the 3–6 cm. long petiole; inflorescence corymbose, heads on pedicels 5–10 mm. long, about 75-flowered, 8 mm. high and broad; bracts narrowly lanceolate; scales of the involucre of equal length, linear-acuminate, 2–3 ribbed, equaling the corollas and pappus; corollas tubular, ampliate above, purple or whitish, the lobes slightly pubescent; akenes linear, 2 mm. long, sharply angled, smooth and glabrous, contracted above and tipped with a thickened ring; bristles of the pappus few and very slender, extremely deciduous.

Collected by Dr. C. A. Purpus, at San Pablo, Baja California, in 1898, and by the writer at the same place in 1889.

Var. **monticolum.** Leaves broadly cordate-ovate, with lower part

of stems pubescent, upper portion, pedicels and involucres so glandular-viscid as to catch numerous small insects; akenes pubescent on the angles and somewhat so on the faces, scarcely contracted under the indistinct callous ring; heads whitish and sometimes with a purple tinge.

High mountains of the Cape Region, Baja California. Perhaps this variety may prove to be a distinct species.

Eupatorium peninsulare. Shrubby, 1–2 m. high, glabrous; leaves opposite, halberd-shaped or hastate, acuminate, more or less crenate-serrate, abrupt or cuneate at base, the largest 10–12 cm. long, 6–7 cm. wide on petioles, 2–3 cm. long, strongly 3-nerved from the base or in large leaves from some distance above the base; inflorescence paniculate from the ends of the branches; bracts of pedicles linear-lanceolate, 1–2 mm. long; heads 8–10 mm. long; involucre spreading, in 3–4 series, about 10-flowered, the outer bracts minute, ovate-obtuse, the inner 5 mm. long, narrowly ovate-lanceolate, striate, scarious-margined, longer than the akene, all ciliate pubescent; akenes clavate, densely hirsute, tipped with the $\frac{1}{3}$-mm.-long persistent style-base; flowers tubular, styles clavate; corollas pale; pappus bristles rather stout, somewhat enlarged at tip, not deciduous.

Common throughout Southern Lower California, San José del Cabo, Sierra de la Laguna, San Francisquito, San Bartolomé, Cañon Hondo, San Julio. A species remarkable on account of its rather broad involucral scales, hirsute akenes and cylindrical flowers.

A plant from Ojo de Agua, Comondu, which seems to belong to this species, has broader involucral bracts and the leaves are occasionally somewhat cordate.

Erigeron Socorrensis. Suffrutescent, glabrous; leaves narrowly oblanceolate, attenuate, tapering into a margined petiole, acute, 6–8 cm. long, 6–8 mm. wide, minutely and sparsely pubescent, crowded about the ends of the branches; heads 3–4 mm. wide, corymbosely paniculate from the ends of the branches; involucres somewhat imbricated, its scales linear lanceolate; rays white, numerous, linear, $1\frac{1}{2}$ mm. long; pappus of disk flowers simple of 15–20 delicate, fragile bristles, that of the ray scantier; akenes 2-nerved, flattened, sparsely hirsute.

Socorro Island, where it is said to be abundant in places, as a bush 3–4 feet high. Anthony's No. 376.

Alvordia fruticosa. A much-branched scabrous shrub 1–2 meters high; leaves strigose pubescent, ovate-lanceolate, entire, 3-nerved, 3–5 cm. long, on petioles 5–8 mm. long; heads 1 cm. long, glomerate at ends of peduncles 3–4 cm. long; involucres narrow, flattened; bracts obtuse, ciliate, about 5, the exterior ones navicular, the inner much longer; flower yellow, solitary in the involucre and rayless; pappus of many lanceolate, unequal paleæ, shorter than the 3-mm.-long, flattened akene.

San Jacinto, San José, and Todos Santos of the Cape Region of Baja California. This plant has been distributed as *A. glomerata* Brandegee. It is a bush sometimes 6 feet high, much branched, and forming clumps 4–5 feet in diameter, covered with yellow flowers at the ends of the branches. The distinctions between herbarium specimens of this species and *A. glomerata* are found mainly in the inflorescence. The single flower, the absence of sterile akenes and bracts upon the receptacle, the smaller fruit and different pappus easily distinguish it from the original species. If this species from the Cape had been the one first collected, its relationship would have been somewhat doubtful on account of the absence of receptacular bracts.

Leptosyne insularis. Herbaceous, diffusely branched, and spreading; leaves $2\frac{1}{2}$ cm. long or less, once or twice dissected into narrowly-linear divisions; heads small, 5–7 mm. wide, axillary and terminal on peduncles 6–10 cm. long; bracts of the outer involucre linear lanceolate and loose, of the proper involucre ovate or oblong-acuminate, 4 mm. long; bracts subtending the flowers in the head linear; ray flowers pistillate, yellow, 2-lobed, 5 mm. long; akenes broadly winged, elliptical, smooth; disk akenes narrowly margined.

The specimens, consisting of branches about 3 dm. long, are fragmentary. It seems to be an herbaceous perennial, though better material is needed to be certain. No hairy ring is found within the corollas. Anthony's No. 394. Socorro Island.

Cordia Socorrensis. Scurfy pubescent except the inflorescence and upper surface of the leaves; leaves 2–3 cm. long, $\frac{1}{2}$–1 cm. wide, lanceolate, cuneate at base, crenate, rugose, on petioles 2–5 mm.

long; spikes pedunculate, 1–2 cm. long, densely flowered; calyx sessile, 3 mm. long, 5-toothed; whitish corolla four times as long, cylindrical, the short spreading five lobes crenate margined; stamens inserted at the middle of the throat, slightly exserted; anthers sagittate; style parted to the middle into two deeply-cleft branches; fruit unknown.

This plant somewhat resembles *C. Palmeri* Watson and like that species belongs to De Candolle's Sec. *Myxæ (Spiciformæ)*. It is probably a shrub. Anthony's No. 384. Socorro Island.

Cestrum Pacificum. Densely pubescent with branching hairs; leaves ovate somewhat pointed, cuneate at base, 8–12 cm. long, 5–6 cm. wide, pubescent especially on the lower face with interlaced branched woolly hairs; petioles 1–2 cm. long; inflorescence in small axillary panicles, the flowers sessile or nearly so; corolla 10–12 mm. long, tubular-funnel form, the spreading pubescent, acuminate lobes 3 mm. long; calyx tubular, half as long as the corolla, pubescent with grayish branched hairs, teeth 1 mm. long, deltoid-acuminate; stamens included; filaments thickened below and toothed.

Probably a bush. The specimens are young and lack mature fruit. A grayish aspect is given to the whole plant by its dense woolliness and the flowers, apparently ochroleucous, are very numerous. Socorro Island. Anthony's No. 391.

Nicotiana Stocktoni. Pubescent throughout and somewhat viscid above, 4–5 dm. high; leaves 8–10 cm. long, 6–8 cm. wide, oblong to round-ovate, obtuse, cordate at base with undulate margins, on broad wing-margined and somewhat clasping petioles, 3–8 cm. long, more pubescent above than below; flowers in a loosely-spreading panicle, on pedicels 3–8 mm. long; corolla 4–5 cm. long; tube narrowly tubular with ventricose throat, tubes spreading 6–8 mm. broad, greenish-white, pubescent; calyx lobes lanceolate, obtuse, 5 mm. long, equaling the campanulate tube; capsule as long as the calyx.

Collected on Socorro Island by Mr. A. L. Stockton. Apparently annual and somewhat related to *N. repanda* Willd. Anthony's No. 382.

Teucrium affine. Low, diffuse, glabrous herb; leaves linear or ovate, obtuse, cuneate at base, entire, 2–3 cm. long, 5–6 mm. wide,

on petioles 1–2 mm. long, the upper ones gradually becoming sessile bracts; flowers solitary on peduncles 5–7 mm. long; calyx 5 mm. long, deeply lobed; corolla white 10–12 mm. long; seeds 2–3 mm. long furnished above with a few bristles.

Very closely related to *T. Townsendii* Vasey & Rose,* of Clarion Island, and might perhaps be considered a variety of that species. It differs in having narrower and longer leaves not so densely crowded upon the stems, lobes of the corolla not as broad and rounded, lobes of the calyx narrower and seed differently marked. Anthony's No. 385. Socorro Island.

Euphorbia Anthonyi. Frutescent, 2½ dm. or more high, much branched, glabrous; leaves opposite, 1–1½ cm. long, 5–8 mm. wide, fleshy, crowded, 2–3 times longer than the internodes, more or less broadly oblong or somewhat oblong-obovate, obliquely truncate or cordate at base, entire; stipules small, triangular-setaceous; involucres 2 mm. long, crowded in axillary capitate clusters along one surface of the ends of the branches; glands 4, dark brown, usually without appendages but sometimes very narrow dark brown ones can be found; capsule 1–1½ mm. long, pubescent, obtusely angled, twice the length of the 2-cleft styles; seeds oblong, pointed, 4-angled, ash-colored and deeply rugose upon the faces, 1 mm. long.

The leaves are usually very oblique and many are rose-colored about the margins. The crowded involucres are almost black and contrast conspicuously with the light green leaves. San Benedicto Island. Anthony's No. 369.

Acalypha umbrosa. Frutescent, shortly pubescent and glandular; stems terete, purple, branched; leaves ovate, crenate-serrate, obtuse or acuminate, truncate at base, 10–14 cm. long, including the 4–5-cm.-long petioles: sterile spikes 2–3 cm. long on peduncles of the same length: fertile spikes axillary, 6–7 cm. long, loosely flowered; bracts 1–2 flowered, subequally 14–25-toothed, 6–7 mm. wide, the margins beset with stipitate glands; styles 3, twice divided; capsule hirsute; seed ovoid, nearly black, with white caruncle and under a lens minutely roughened. Socorro Island. Anthony's No. 375.

Euphorbia Clarionensis. Frutescent, 2½ dm. or more high, much branched, glabrous; leaves opposite, 1–2. cm. long, 5–8 mm.

*Proc. U. S. National Museum, xiii, 146.

wide, fleshy, crowded, unequal, on petioles 1 mm. long, broadly oblong or somewhat oblong-obovate, truncate, or cordate at base, entire; stipules triangular-setaceous, 2 mm. long; involucres 2 mm. long, pubescent, crowded in axillary capitate clusters along one surface near the ends of the branches; glands 4, dark brown, two with white appendages 2 mm. long and two almost unappendaged; capsule 1½ mm. long, pubescent, obtusely angled, four times the length of the 2-cleft styles; seeds 4-angled, flesh-colored, transversely rugose and minutely tuberculate, ½ mm. long.

Near *E. Anthonyi*, from which the white appendages of the glands and lighter-colored capsules give it a very different appearance. The seeds of *E. Clarionensis* are also one-half as large, of a different color, not so rugose and minutely tuberculated. The habit of growth and leaves are much alike in both and they are plainly derivatives from a not remote common type. Clarion Island. Anthony's No. 406.

Phyllanthus peninsularis. Frutescent, 1 meter high or less, much branched, glabrous; leaves from ovate to round-obovate or oblanceolate, acute, 1–1½ cm. long, ½–1 cm. wide, on petioles 1–2 mm. long; stipules lanceolate-setaceous, 1–2 mm. long; inflorescence axillary; staminate flowers on pedicels 4–5 mm. long; calyx of six ovate acuminate segments 2 mm. long, white margined; glands 6, orbicular; stamineal column 1 mm. long: fertile flower either solitary in the axils of the leaves or with several staminate ones; pedicels longer than those of the male flowers; calyx 6-parted, segments 4 mm. long, 3½ mm. wide, obovate, acute; glands 6–7; styles 3, shortly bifid or trifid; mature capsule depressed-globose, somewhat obtusely angled, glabrous, 3–4 mm. in diameter; seeds roughened transversely in sinuous lines.

San José del Cabo, Sierra de la Laguna. This is No. 539 of my Cape Region collection and was named by Dr. Millspaugh *P. polygonoides* Spreng. It is, however, quite different from that species in appearance, in the shape of the leaves and their larger size. The stamineal column is hardly separated at the apex and the glands are larger and differently shaped. The seeds are 6–10 times larger, with different markings. It grows 2–3 feet high, with many slender woody stems from the roots, branching and forming a small entangled bush. Anthony's No. 364.

Hechtia montana. Dicœcious; leaves numerous in a dense rosette, long attenuate from the base, 2½–3 dm. long, 2–3 cm. wide at base, white-scurfy below, greener and striate above, sinuate-spinose, the spines usually recurved, stem leaves 1–1½ dm. long, 8–10 mm. wide, spinose, sessile by a broad base; panicle white-scurfy, 4–5 dm. long, the numerous branches simple, 8 cm. and less long; bracts 3 cm. long, 8 mm. wide; long prickly-serrate and gradually becoming smaller to the ends of the panicle: male flowers 4 mm. long on pedicels of the same length, sepals deltoid, acute, 3 mm. long, petals twice as long, cymbiform, creamy-white, rudimentary styles very short: female flowers on pedicels 6–8 mm. long, with narrower and more acuminate, persistent sepals and petals having an evident mid-nerve; capsule 1 cm. long with a short beak, septicidal at first, finally splitting loculicidally about half way down.

Common about San José del Cabo along the base of the mountains, sometimes completely covering large areas. Near to *H. pedicellata* Watson, differing chiefly in the more acuminate-beaked and more rugose capsule and the longer acuminate persistent petals of the female flower. The panicle at maturity loses its floccose scurfiness.

REVIEWS AND CRITICISMS.

American Algæ: Century III, 1898. Issued by JOSEPHINE E. TILDEN (Minneapolis, Minn.).

The third century of Miss Tilden's American Algæ is of considerable interest to workers on the Pacific Coast, since it contains quite a number of the larger and more conspicuous marine forms. A number of specimens, however (notably numbers 204, 206, 207, 208, 209, 211, 212, 214, and 243 in our copy), are either so very fragmentary or so imperfectly preserved as to be of no value for comparison. One notes also that several of the more striking and well-known forms are masquerading under the names of quite different species, or under names which have been abandoned. A few of these may be mentioned, as follows: No. 201, Peyssonnellia Dubyi, is Hildenbrandtia prototypus Nardo, not sterile, as the label says, but with good fruit; No. 202 is not Petrocelis cruenta,

but is to be compared with P. Middendorfii (Rupr.) Kjellm.; No. 203, Constantinea Sitchensis, is C. rosa marina (Gmel.) P. & R.; No. 218, Gigartina exasperata is simply a luxuriant young form of G. radula (Esp.) J. Ag.; No. 219, Gigartina radula, is plainly G. papillata (Ag.) J. Ag.; No. 222, Gigartina microphylla, is a young Grateloupia; No. 239 is certainly not Laminaria digitata as understood by European and Eastern algologists, since it possesses mucilage ducts in the stipe, but is to be compared with forms of L. Bongardiana P. & R.; No. 241. It generally requires either considerable experience with Alarias in the field, or the lack of it, to give the ordinary algologist the courage necessary to propose to add a new species to this already well-stocked and variable genus. Yet in *Alaria cordata* Tilden, we find such a creation, so little characterized either by the specimens distributed or by the description published that its sole claim to specific distinctness seems to rest upon the shape of the base of the sporophylls. But we are not told, directly or indirectly, how we may distinguish *A. cordata* from either *A. Pylaii* Grev. or *A. grandifolia* J. Ag., in both of which the same character occurs; No. 242. Adenocystis Lessonii is clearly not this brown alga of the Antarctic Ocean, but the well-known red alga Halosaccion Hydrophora (P. & R.) J. Ag.; and No. 281, Codium tomentosum, is C. mucronatum, var. Californicum J. Ag. These are a few of the most conspicuous of the liberties taken with the names of our Pacific Coast species and are sufficient to demonstrate that greater care should be taken in determining the plants promised for Century IV than has been used in connection with the century before us.—W. A. S.

SHORT ARTICLES.

A New Weed on Western Ranges.—In July of this year Mr. H. H. Chapman, of Ashland, Oregon, sent to the U. S. Department of Agriculture a plant which was becoming a troublesome weed in that locality. He stated that it was first observed there about four years ago, and now it has taken possession of about 100 acres of the range. Stock do not eat it, and therefore it grows

and produces seeds unmolested, while the nutritious grasses and other plants are kept down by grazing.

The plant was identified as Molucca Balm *Moluccella lævis* L., an annual of the mint family. It is sometimes cultivated as a curious plant in flower gardens and is called Shell Flower and Shell Balm because its peculiar green flowers bear some resemblance to shells. The plant is glabrous throughout, one to two feet high, with rather stout branching stems. The leaves are roundish in outline with crenate margins. The flowers form the most striking character. They are green, with prominent reticulated veins, bell-shaped, about 1¼ inches long, and appear very much like green morning-glory flowers. These large green corollas are persistent, finally turning whitish or straw color. As is the case in other plants of the mint family, each flower produces only four seeds, but the flowers are numerous, and a large proportion of them seem to have their full quota of well-developed seeds. These are somewhat smaller than wheat grains, but large enough and heavy enough to form a dangerous impurity in wheat that is not carefully screened. The persistent corolla aids in their distribution by the wind.

The plant is native in western Asia, where it is a weed of roadsides and fields. Specimens have also been received from eastern Oregon and from Oracle, on the northern slope of the Santa Catalina Mountains in Arizona. Reports of new localities are desired.

LYSTER H. DEWEY.

Washington, D. C.

NEWS NOTES AND CURRENT COMMENT.

IN his presidential address before the Science Association of the University of California in May, 1898, Prof. W. A. Setchell gave a general account of thermal algæ and of the conditions under which they were found, particularly as observed by him in California. In conclusion he suggested that the ability of the Blue Green algæ to endure high temperatures may have been a primitive and not an acquired characteristic; that the first waters of the earth inhabited by organisms were probably of high temperature; that the descendants of those early organisms were left stranded in the natural hot

waters much as the peculiar alpine floras of the north temperate zone were left stranded by the recession of the glaciers. Two sets of facts gave point to this fascinating suggestion: first, the Blue Green algæ of the hotter waters are nearly the same everywhere; second, the cell structure of these algæ is far simpler than that of any other organism. The address, under the title of "Life in Hot Waters," may be found in the *University Chronicle*, of the University of California, for June, 1898.

A COPY of Strasburger, Noll, Schenk and Schimper's Textbook of Botany, published by MacMillan & Co., New York, has been sent us by Mr. E. F. Goodyear, their Pacific Coast agent, at 327 Sansome Street, San Francisco. We have also received from B. R. Baumgardt & Co., Los Angeles, California, a botanical reader for children, by Alice Merritt Davidson, entitled "California Plants in Their Homes," which we expect to notice further in a later issue.

Two Californian species of Calochortus have recently been figured in English periodicals, *C. clavatus*, in *Curtis' Botanical Magazine* for July, 1898, and *C. Purdyi*, in the *Gardeners' Chronicle*, xxiii (ser. 3), 395, fig. 147, June 25, 1898. The August, 1898, number of the former periodical also contained an illustration (t. 7610) of *Ledum glandulosum*.

MR. C. G. LLOYD, of Cincinnati, Ohio, has sent us Nos. 23 and 24 of "Photogravures of American Fungi," which are most excellent habit pictures of a specimen of *Polyporus Berkelayi* two and one-fourth feet across. Issues No. 25 and No. 26 present examples of *Polyporus umbellatus* and *strobilomyces strobilaceus*, and are equally creditable.

THE BOTANICAL SEMINARY of the University of California is now in the second year of its series of discussions concerning heredity. Two papers read before it during the present college year have been published in the *University Chronicle* and reprinted as "Contributions from the Botanical Seminary of the University of California." The titles are: "Problems of Heredity," by W. J. V. Osterhout; and "Unity in Variability," by Hugo de Vries, translated by H. T. A. Hus.

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ERYTHEA

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EDITED BY

WILLIS LINN JEPSON,

Instructor in Botany, University of California.

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CALOCHORTI IN THE SIERRA NEVADA.

By Geo. Hansen.

With the admiration for the beautiful coloring of the species of Calochortus is usually connected regret over the failure to "do" them well in our gardens. A few hints from one at home near the Calaveras Big Trees, may, perchance, cause some disappointments to be avoided, and encourage the growing of the

"MARIPOSA LILIES."

Calochortus venustus Benth., the true Mariposa Lily, is the most common. It varies to a very great degree, displaying all shades from a soft French white to the richest purple, spotted and dotted, and more or less hairy towards the bottom of its lovely cup-shaped flower. It grows in colonies, and at times covers entirely the sides of the hill. Yet I have also observed that it will disappear almost as suddenly as it appeared, the cause of which I never quite understood. There was but very little difference in the rainfall of the different seasons, and the conditions of light and shade under which the plants grew, had not been interfered with either. If Nature herself causes such changes, we can not be surprised to find that the bulbs disappear at times in our home gardens, when aware that no great change has taken place in the condition of their surroundings. It might be said, though, that their reoccurrence at the very same places in the hills might be looked for if we come to know that an adventive bud forms just below the surface of the soil. If the old bulb has ceased to flourish, be it that it has outlived its usefulness, be it that some conditions under which it succeeds best have changed, it would take the new bulblet, which forms attached to the stem and sheltered by a leaf, several years to reach the flowering stage, and, meantime, it is more than natural that we overlook the narrow leaf of the young bulb amongst the dry grass which surrounds it.

C. venustus grows from an elevation of about 1,000 feet upwards. The pink and copper-colored varieties were most frequent at abou

2,200 feet elevations, but even there they were lavishly mixed with the pure white varieties. It is true, though, that towards their highest zone of occurrence, about 4,500 feet, the washed colors of pink and white were more general, and by far less clear in their markings on the outer side of the cups, than they were at lower altitudes.

The yellow Mariposa Lily, *Calochortus luteus* Dougl, is the most glorious of all those in the Sierras. Its deep golden color is often marked with a rich brown spotting and finer penciling. It resembles in all respects the *C. venustus*, in size as well as shape. But while it commences to appear at about 500 feet elevation, it was found by me at no higher altitude than 1,800 feet. At this point it was where I came across hybrids between the two species, which were paler in their yellow, and rather less pronounced in their marking as the purplish shades of the *C. venustus* caused a brownish bronze coloring which washed the petals on their entire outer surface.

Both of these species grow on hillsides as well as level, so-called meadows. It should be remembered, however, that California meadows at such altitudes, viz., 500 to 2,000 feet, resemble a parched brick-yard at the middle of June, when the flowering is at its best. While snow falls as low down as 2,000 feet elevation, it never remains longer on the ground than a day or two. The rains do not set in until the middle of November, and cease entirely by the first week in May. It follows, therefore, that we must select spots sheltered during winter and yet exposed to all the heat of summer, and that we must avoid every form of irrigation near our Calochorti.

Of true Mariposa Lilies the third is *Calochortus Leichtlinii* Baker. It most resembles the *C. venustus*, yet is far darker in its white, and is bronze-colored on the outside of the petals. It is at home in the higher regions, beginning where *C. venustus* ceases to occur, and yet growing at the summit, 8,000 feet high. At the latter region it is barely higher than four to five inches, and as tall as 12 inches at 5,000 feet altitude. It seems to prefer rocky slopes, growing in decomposed lava, and then only in open spaces.

"SNOWDROPS AND CAT'S-EARS."

Of the Calochorti with nodding heads and bearing from two to

twelve flowers on one stalk, *Calochortus albus* Dougl. is the most noble. It is fitly termed "Snowdrop" by the population hereabouts in Amador County. Our florists should take up its culture, and they may be assured that the most desirable companion for orchids in any combination is represented in this very Calochortus. Its white is glossy, transparent, and oftentimes tinged with a delicate pink shining through from the internal coloring of the petals, which are entirely closed. The thick, fleshy hairs possess the pink pigment also, and add greatly to the beauty of the flowers. Strong bulbs will send up spikes fourteen inches high, and the single green leaf at the base reaches a length of twelve inches by a width of one inch. *C. albus* occurs from 1,500 to 2,500 feet elevation, and seems to prefer more sheltered hillsides, at times even deep shady undergrowth of pines.

Calochortus Benthami Baker is dwarfish in its habit. Its leaf of bluish-green color reaches greater development than the flower stalk, being at times as long as twelve inches, whereas the flowers hang over on a stalk barely five inches high. The flowers are open, thickly set with fleshy hairs, which caused the name of "Cat's-ears" to be applied to them. Greenish yellow on the outside, the inner coloring of the petals is a rich sulphur yellow. Most of the flowers have a brown spot at the base of the petals, which at times is very large and deep in color.

This *C. Benthami* grows from 1,500 up to 4,500 feet elevation, keeping, therefore, company with the true Mariposa Lily, *C. venustus*, but it flowers at a different time, being one of the first blooms in spring. As *C. albus* is the next to open, it is plain that no hybrid, between *C. Benthami* and *C. venustus* could occur, whereas the hybrid *C. albus* × *Benthami* has been found by me at different occasions. It is rare, though, and of a most beautiful pale sulphur yellow, well worthy of being produced in an artificial way by our horticulturists.

The lavender-colored *Calochortus cæruleus* Wats. is the companion of the Mariposa Lily *C. Leichtlinii*. It has the habit of *C. Benthamii*, and grows under the shelter of the giant pines, peeping out from under the thick layer of pine needles. It is not found till an elevation of 5,000 feet is reached, but there it abounds by thousands, covering the ground with its tiny bells of lavender and white.

REVIEWS AND CRITICISMS.

Elementary Botany. By GEORGE F. ATKINSON (New York, Henry Holt & Co.).

The author of the little book before us has evidently had it in mind to make a "judicious selection of a few forms to illustrate function, process, and relationship throughout the wide range of plant life" and to train "in logical methods of induction, and accuracy of drawing conclusions" from the data presented. In many ways he has made a fair beginning towards attaining his object. He begins his course of study by selecting Spirogyra, for the purpose of teaching the pupil how to arrive, logically, at the conclusion that a certain definite portion of the Spirogyra-cell is protoplasm. Protoplasm continues to be the subject of investigation for some pages, when the matters of absorption, diffusion, and osmose are taken up and their nature demonstrated experimentally. This simply forms an introduction to the study of the processes of nutrition, growth, and irritability in general, and this, in turn, is followed by a somewhat detailed study of the morphology and life history of a number of representative plants. The lower plants are treated somewhat briefly, especially the Brown and Red Algæ; the very inadequate treatment of the latter, indeed, is especially to be noted. The treatment of the Fungi is at least more balanced and intelligible than that of the Algæ, but even this group hardly has its proper attention. In decided contrast are the groups from the Liverworts up; these plants are fairly well treated and the information given concerning them is excellent and quite up to date.

After the physiology and morphology, there comes a series of lessons on plant families devoted, as is highly proper, entirely to the Flowering Plants. Lastly comes Plant Ecology, a part of the book which is by far the most interesting of all. It, as well as the chapters devoted to physiology, breathes a spirit of the subject treated of, which is much more than can be said of almost any other text-book written of late years. Most text-books treat of these subjects as of so many facts to be classified, so many facts of physics or of chemistry, but the particular significance in the case of the plant is lost sight of altogether. In Professor Atkinson's account one feels

that the plant is alive, is working for its own living, is struggling with its neighbors to obtain its share of the bounties of nature, making use of them even in its efforts to compete with them to obtain the air and sunshine so necessary to its continued existence and the carrying out of the purposes of its being. To have done this so successfully as Professor Atkinson has done is certainly enough to expect of one small book. And it is in this line that the book will be of the greatest value, for it will help the teacher of all grades to properly appreciate this spirit and to endeavor to inculcate it into the pupil. As to the pupil, the book is not quite as suitable as we could wish to see it. True, it leads the pupil to logical methods of induction, but by telling him exactly what to think and in what sequence. It leaves him little to do for himself, and it happens at times that he is led to draw very general conclusions from data of insufficient scope.

The book is abundantly illustrated, and many of the illustrations are very fine indeed, but intermixed are some which are very poor. The illustration of Fucus (Fig. 119), *e. g.*, is certainly one not to be admitted to any book, for, if one did not know the plant in question, he would obtain a very sorry idea of it from figure 119. There are other figures almost as bad; while, on the other hand, there are many of the illustrations which will be very welcome additions to our heritage of botanical cuts. As to the accuracy of the facts set forth, the writer has not cast at all a critical eye upon them. He is somewhat surprised, however, to find that iodine solution, which he has always used as a reagent to kill cells and small animals quickly, is said (p. 4) to stain the *living* protoplasm. The author also makes certain departures from the ordinarily-accepted usage, *e. g.*;—in beginning all plant names other than the binomial with small letters;—in employing the spelling "pollenation," etc.;—in occasional lapses from good grammar:—little things, but yet those in which accuracy is more essential in a book having the purpose of this one in view, than in monographs or special papers.—W. A. S.

Synopsis Characearum Europearum. Illustrate Beschreibung der Characeen Europas mit Berücksichtigung der übrigen Welttheile. Von Prof. Dr. Walter Migula (Leipzig, Eduard Kummer, 8 mk.)

This little book, an extension of the account contributed by this

authority to the fifth volume of the second edition of Rabenhorst's Kryptogamenflora, will be welcome to all those who, having been attracted toward this interesting group of plants, have yet been prevented from studying them by the lack of a suitable monograph of moderate cost. Professor Migula, at the urgent solicitation of the editors of the Rabenhorst, has supplied this need. The handy volume before us contains a general account of the morphology and development of the Characeæ, directions for collecting and preserving, and finally a systematic account of the genera and species. The European species and varieties are given in completeness of detail, and every species except one, and many varieties are figured most carefully and excellently. Reference is made to species and varieties occurring in other countries also, so that the scope of the usefulness of the book is world-wide.—W. A. S.

NEWS NOTES AND CURRENT COMMENT.

We regret to record the death, on Dec. 5, 1898, of Mr. G. H. Hicks, First Assistant in the U. S. Division of Botany at Washington and Specialist in charge of the seed-testing work. Mr. Hicks was one of the founders, and for many years President, of the Gray Botanical Chapter of the Agassiz Association, and for some time past has been Editor-in-Chief of the *Asa Gray Bulletin*.

A list of the "Lichens of Southern California" in the form of a 20-page pamphlet has been issued by Dr. H. E. Hasse, of the Soldiers' Home, Los Angeles County. Many of the determinations were made by Dr. W. Nylander, who also furnishes the diagnosis for some half dozen new species. Over three hundred species are listed, yet this number is, according to Dr. Hasse, but a "tithe of the interesting lichens" of that part of the state.

Prof. Carl Schröter, Director of the Botanical Museum and Professor of Botany at the Swiss Polytechnic in Zurich, who is now taking a journey around the world for the purpose of making a special study of Economic Botany, recently visited the grounds and gardens of the University of California. Professor Molisch, of the University of Prague, has also, not long since, been traveling through

California, and was the guest of resident botanists at Berkeley and in San Francisco.

THE new species described by Professor Greene in the last issue of *Pittonia*, Part 19, can not here be listed, but the titles in most cases indicate the genera in which they occur. "New or Noteworthy Violets" and "New Species of Convolvulus" relate chiefly to West American botany, as does the "Fascicle of New Labiatæ," which contains new species of Stachys, Hedeoma, and Lycopus. This part completes Vol. 3; accompanying it we note the presence of a specific index to the volume. To the previous volume was appended merely a generic index, yet there are few publicatians in America that can dispense with so necessary an adjunct as a specific index less readily than *Pittonia*.

MR. D. G. FAIRCHILD, of Washington, D. C., visited the Pacific Coast in December, 1898, as an agent of the United States Department of Agriculture. He goes from here to New Orleans and thence to South America, where he will travel for two years as a botanical expert, visiting all the Spanish-American republics in the interests of the United States Government. Dr. C. Hart Merriam, chief of the Division of Zoology, spent the entire summer of 1898 in zoological field work in the Californian Sierras, and devoted also considerable attention to the trees and shrubs. Mr. F. V. Coville, chief of the Division of Botany, visited again last year the Forest Reserves in western Oregon.

WE HAVE received the first number of *Rhodora*, the monthly journal of the New England Botanical Club, which is devoted to the scientific interests of the flora of New England. The Editor-in-Chief is Dr. B. L. Robinson, Curator of the Gray Herbarium, and the Associates are Mr. F. L. Collins, Mr. M. L. Fernald and Mr. Hollis Webster. Mr. Fernald contributes an article on the "Rattlesnake Plantains of New England;" Mr. E. Brainerd writes of the "Saniculas of Western Vermont," while Mr. F. S. Collins provides the first of a series of "Notes on Algae." Even new species of flowering plants are not lacking to this initial number, for Dr. Robinson names *Lactuca Morssii*. "A New Wild Lettuce from Eastern Massachusetts." Mr. Hollis Webster has some "Notes on Some Fleshy

Fungi found near Boston," and there are short notes by Mr. Walter Deane and others. The contributions are, invariably, of permanent value and will, in many cases, be consulted by the general worker. Such a journal, fresh and attractive as the shrub of the New England bogs whose name it bears, should do much to awaken a wider interest in the flora of that region and stimulate local zeal.

We learn of the death of Dr. Anton Kerner, Ritter von Marilaun, professor of botany in the University of Vienna and director of the botanical gardens in that city. No botanical text in this country has ever attained to such immediate and general popularity as the recent translation of his "Natural History of Plants." He was noted for his researches upon pollination.

A detailed histological investigation of the flower and embryo of the Isoetes-like *Lilæa subulata* of Western America, by Prof. D. H. Campbell, made its appearance in the March, 1898, number of the *Annals of Botany*. The flowers are found to be strictly terminal, the apical origin of the anther and ovule being very similar to that of Naias and Zannichellia, previously studied. The inflorescence, which is a spike, is commonly described as having the lowest flowers pistillate, the uppermost flowers staminate, and the central ones perfect. The author tells us that he has seen cases where all the flowers were staminate, and Hieronymus has recorded cases where all the flowers were pistillate. The so-called perfect flowers are regarded as probably being a secondary inflorescence made up of two flowers, since there is a division of the primordium or young shoot into two equal parts, appearing to be a true dichotomy as occurs in Naias previous to the formation of the flower. The lateral origin of the root in the embryo is said to be suggestive of Isoetes, and it is thought possible that the "basal segments of the embryo with the suspensor might be interpreted as equivalent to the foot in the embryo of the Pteridophytes."

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THE LILIES OF THE SIERRA NEVADA.

By Geo. Hansen.

Lilium pardalinum Kell. The excessive dryness of the Sierra foot-hills drives this moisture-loving lily into the cañons and ravines. Even there in places where it was once plentiful and gathered in magnificent bunches by those arriving in the "days of '49," it has become rare and rarer, till now we have to climb amongst rocks and dig in deep deposits of loam to secure this bright Tiger Lily. I have found its stalks as high as six feet, nodding over precipices or standing upright and displaying from one to six or seven flowers. Wherever found, it inhabits bright, sunny spots, and delights us by its fresh and clear color of orange, often washed with deep brownish red. The spots of deep maroon are very thick (and yet distinct from each other) on a lighter ground color of orange.

Thus distributed, I have found *L. pardalinum* from 1,000 feet up to 4,000 feet. At the latter elevation one begins to find subalpine meadows. While the brightness of color, the density of the herbaceous growth, and the deliciousness of the perfume of these meadows have become proverbial, I remember, with double freshness, one especially of the many I have traversed. This one was a meeting-place for the Indians as they traversed the Sierra from California to Carson Valley, in the state of Nevada. They call it "Sopago," deriving the name from the so-called Soaproot, *Chlorogalum angustifolium*. Here, surrounded by the high ridge of the mountain chain on which the emigrant road runs, moist on account of its position on the north slope, stretches a wide vale under the shelter of giant pines and firs, which are safe from the murderous axe on account of their inaccessibility. Scattered settlers have set up homesteads here and there, and in the cleared areas, where their garden and grain plants ripen into rich crops in the deep, loose blackish soil, was the largest field of *Lilium pardalinum* I ever beheld. What a stand of lilies! They grew in thickets stem by stem like grass in the meadow, four feet high, all with nodding heads of from four to seven flowers. Standing in the opening as

they did, their color was clearer—more orange—and the foliage shorter, and the stem more robust. Contrary to common belief, I was surprised to learn that the disturbance of the plowshare rather favors than injures the growth of the lily, its corms dividing into fragments, each of which produces a new plant if but half covered by the rich warm soil under a sky the clearness and brightness of which render everything in its sphere grand and delightful.

Lilium Humboldtii is another so-called Tiger Lily, of more sturdy growth and majestic character, the "Pardalinum of the hillsides." It occurs at about 2,000 feet elevation, always selecting the open pinewoods, never found near water, but always preferring slopes facing north. In this region, all the old timber growth has been cut off, and as we drive along the roads we may see the bright bunches made up of 5 to 25 flowers on a stalk, shining brightly through the thin boughs of pines. As the hazelnut is the steady companion of *L. pardalinum*, so the cream-colored *Iris Hartwegii* is always to be found where *Lilium Humboldtii* abounds. Two causes render this lily more and more scarce: the stand of even the second growth of pines is being cleared away and replaced by grain fields; in the second place this species, wherever it occurs, is found in such thick growths as to invite the settler to supply his garden with lilies from the fields. Lastly, it may be said that it requires fully three seasons for *Lilium Humboldtii* to bloom again if it is once disturbed, and, unlike *L. pardalinum*, the plowshare is its sure death.

Lilium parvum, Kell. As its name indicates, the flowers are small. Their color is orange, with spots on the inside of the petals. It belongs to the alpine region, reaching as high as 8,500 feet in the region I traversed, and does not occur below 4,500 feet. Wherever I found this lily, I noticed two forms, neither of which approached the other in any intermediate specimens. The smaller one reaches a height of four feet. Its build is light, and upon the stem, set with scattered leaves of light green, stand loosely from two to six or seven flowers. The other kind is a giant in stature and makeup. The stems are woody and hard, set with whorls of rich deep green foliage, and carrying heads with from 20 to 50 flowers. I did not notice any difference in the flowers, and while it may be possible

that this giant is nothing but a "Sequoia" amongst its kind, it is plain that the two varieties are widely different in appearance.

Lilium Washingtonianum, Kell. High upon the ridges, exposed to storms from east and west, in soil of scantness and dry almost as the granite from which it derives its existence, there grows the Queen of the Lilies of the Sierras: *L. Washingtonianum*. Bands of sheep and cattle trot by on their way to the sweet meadows of the alpine region, and no herb, no limb of recent growth may be detected other than the bitter barked Aspen or the prickly Snow-brush. I write of the ridge of the spurs bridging from the foot-hills to the snow-fields as it appears in July. Under the shelter of the impenetrable Snowbrush, *Ceanothus cordulatus*, this lily begins its growth at the time that the first bands of sheep start for the mountains. After the "hoofed locusts" have passed, and quietness again reigns on the ridge, interrupted only by the clatter of the horses' hoofs as the stockmen go back and forth to their ranges, then this lily stretches its stately head from under the thorns, and develops its fragrant flowers in the first week of August. They are white, and while I have been told about spotted ones, so spotted, in fact, as to be entirely set with rich maroon on the inside of their petals, I know them from the Sierra of Amador and Alpine Counties only with very tiny spots, and such tiny spots I have found on flowers only now and then. But the plants are grand in their stand, their tall stalks as high as five to seven feet and hanging out to the gentle breeze from two to twelve flowers. Emigrants passed along the ridge I mention for years and years; stockmen followed them, and bands of cattle made this region their home ever after. Therefore, it is likely that this lily may have been much more common in early days than now. Be that as it may, the plants I encountered are well protected from any attack by man or beast, and as we follow along the ridge where the water must be packed for as many as twelve miles of travel, there holds guard this stately flower of our Sierras, delighting all as they pass either on their way to the valleys where the *Lilium pardalinum* is scattered about the winter homes of the settlers, or to where the ring of a hundred bells from the sleek necks of cattle add charm to the region where the tiny *Lilium parvum* grows along streams and precipices.

DIRECTIONS FOR COLLECTING AND PRESERVING MARINE ALGÆ.

By W. A. Setchell.

The marine algæ, or seaweeds, grow either between tide-marks or below them. In the latter case they may grow just below low-water mark, or in deeper water down to a depth of a number of fathoms. The best times for collecting, then, are when the tide is low, since at that time a certain zone, called, for convenience' sake, the litoral zone, is bare of water, and the algæ growing in it may be gathered from the rocks and pebbles on which they are growing; and also those growing in the zone immediately below the litoral zone, which is called the sublitoral zone, may be reached by wading. The lower part of the sublitoral zone, however, lies too far below the surface of the water to be reached by wading, as do also those deeper waters of what is called the elitoral zone. The algæ inhabiting these zones exclusively must either be sought for with the dredge or else the collector must wait until they are detached in some way or other from their places of growth, and floated ashore. The times most advantageous for collecting, then, are as follows:—

1. From the Litoral Zone.—The collecting place should be reached from one to three hours before the time for the occurrence of extreme low water, in order that the collector may follow the tide as it ebbs, *i. e.*, as it goes down. By doing so, two advantages are obtained: in the first place, the period available for collecting is the longest possible, as well as the safest on some coasts; and in the second place, there is less danger of being surrounded by the tide, or of being overwhelmed by the incoming waves and either drenched or even carried off one's feet and taken out to sea by an especially strong undertow. The exact time of each low as well as each high tide during the year may be learned from the "Tide Tables" published by the U. S. Coast and Geodetic Survey and for sale at all custom-houses and agents for charts and other aids for navigation. The tables give the times for all places of any consequence along both coasts of the United States.

2. From the Sublitoral Zone.—The upper part of the sublitoral zone may be reached by wading at low water, as mentioned

above, and the same directions as to times for collecting apply to this as to the litoral region. The lower portion of the sublitoral zone, however, lies too deep for the wader to reach it even though he be provided with a pair of high rubber boots (those worn by fishermen and covering even the thigh are the best), as he should be, and recourse must be had to a boat to assist in the collecting. From the boat many of the species may be seized and hauled into it by means of an ordinary garden rake, if the water be quiet enough, and if the period about the time of low tide be selected. Otherwise it will be necessary to use the dredge. The ordinary dredge, such as is used by scallop-fishermen, will often yield very satisfactory results; or grapnels, made either of iron or of stout wire, may be employed. For really successful dredging with a dredge of any size, steam power is necessary, not only to drag the dredge along over the bottom, but also to haul the dredge up from any considerable depth. But, as a rule, the species to be reached only by means of the dredge are few; and a day spent in dredging, unless one has the opportunity of using a large and expensive plant, is, as Farlow has said in his "Marine Algæ of New England," "a day wasted." At the time of maturity, the algæ of the deeper waters are more or less readily torn away from their attachments, rise to the surface or near to it, and are drifted ashore. Consequently it is well to examine the masses of driftweed driven ashore, especially after storms, in search of these inhabitants of the deeper waters.

3. From the Elitoral Zone.—The deepest waters inhabited by algæ are included under this designation, and the species of this zone are to be obtained only by dredging or when they are detached from their growing places and drifted ashore. Consequently what has been said in connection with the lower sublitoral zone will apply to this zone also.

Localities Most Favorable for Collecting.—The most favorable localities in the elitoral and lower sublitoral zones will depend almost entirely upon the nature of the bottom and the presence or absence of currents. Muddy and sandy bottoms are devoid of algæ, since there is nothing to which they may attach themselves. Shelly and stony bottoms yield, as a rule, the richest harvests, while rocky bottoms are good, but present either too rough or too smooth surfaces, in the one case endangering the safety of the

dredge, and in the other allowing it to slide over without catching. The stony or shelly bottoms of tideways and off points where the currents set strongly are usually clothed thickly with algæ from the elitoral zone up to high-water mark. These are excellent places to dredge. Long stretches of mud or sand yield few if any species of the litoral or upper sublitoral zones, but may be places where many of the species of the deeper or even the shallower waters are drifted in and may be taken by wading or with the boat. A hand-net is very useful to catch floating specimens, especially if there is any decided current. Pebbly shores are often good, and especially when the pebbles are of large size and more or less firmly fixed in position. But the rocky shores are the ones to which the collector is attracted most strongly. The surface of the rock affords an excellent foothold for almost all kinds of algæ, from the tightly clinging crustaceous species to the long, erect, and almost shrubby kelps. Again, upon a rocky shore, the irregularities of the surface are usually so pronounced that when the tide is out, large pools of water are left between tide-marks, in which many and rare forms grow within easy reach of the collector. A shore well supplied with tide-pools is the most desirable of all. The nature of the litoral region of the shore is so accurately and plainly indicated as regards the several features just mentioned, on the charts of the Coast and Geodetic Survey, that good collecting places may be selected almost without a visit. Something may also be told of the nature of the sublitoral and elitoral zones from the charts where the character of the bottom is indicated.

The pools and ditches of the salt marshes are generally the homes of characteristic species, and may be visited at almost any condition of tide, although, in general, the forms display themselves most plainly when the tide is in and the pools and ditches are full of water. The floating scums of such ditches and pools, the films covering the surface of the damp earth between the marsh-grasses, and even coating, in many cases, the stems of the various flowering plants inhabiting the marshes, are of especial interest. Even mud from the bottoms of the pools and ditches, brought home and allowed to stand in dishes, will often become covered with films of different blue-green algæ which do not otherwise give evidence of their presence.

Collecting Apparatus.—An experienced collector takes but

comparatively little apparatus with him on a collecting trip. Something is needed for the transportation of the material collected, and the general receptacle for the specimens may vary to suit the individual tastes of the collector or the particular nature of each different locality. A good canvas or rubber bag with a flap for closing the mouth and a broad strap for the shoulder is the writer's preference. It should be water-tight if possible. A basket or a light paper pail is a very convenient thing for many localities, but is inconvenient when there is much wading to be done. A large, stout pocket-knife, well anointed with vaseline to prevent rusting, and a fairly powerful pocket lens, are absolutely essential. An old spoon is often found of service in gathering from rocks gregarious algæ of small size and more or less delicate consistency. A small geological hammer and chisel are necessary if occasion arises to collect crustaceous rock species, especially if they are calcareous. One occasionally needs a small hatchet if large kelps are to be collected entire, especially on the Pacific Coast. A hand-net is very useful when collecting floating forms, and a scrape-net if one is collecting from piles of wharves or from submerged rocks when using a boat. A pair of fisherman's rubber boots with extensible legs, reaching to the hips, are necessary for wading. Half a dozen homeopathic vials with wide mouths, distinct necks (so that the corks will not loosen and come out), and snug-fitting corks, will be needed for segregating solitary small specimens. A large bottle, or preserve jar, or two, for the specimens which must be brought back in water or for bringing back a supply of water for mounting or other purpose, are a part of the usual outfit. Most specimens, however, whether coarse or fine, may be wrapped in newspaper and stored in the general receptacle until examined or prepared for the herbarium or for future study. Consequently, it will be well to take along a plentiful supply of old newspapers. Each species or even each specimen may then be wrapped up by itself and kept apart from the others until it is necessary or convenient to remove it.

Selection of Specimens.—Great care should be exercised in selecting the specimens for study and for preservation. The specimen should be as typical as possible. Imperfect or distorted specimens are to be avoided unless it happens that such specimens are desirable as showing some point or points of particular interest in

connection with its condition. Generally more than one specimen of any particular kind is available while collecting, and it is most profitable to select those that seem to show the peculiarities of the species in the very best manner. But, if only one specimen of a plant unknown to the collector can be seen at the particular time, it is best to take it rather than to risk the chance of happening to find another one later on, even if it does not look like a well-developed plant. It can readily be discarded later if better are found. In the case of crustaceous species, spreading over considerable areas of rock-surface, portions may be removed with the knife, or portions of the rock may be chipped off with the hammer and chisel. If the plant, however, has a distinct and characteristic margin, a portion of this also should be removed as well as a piece from the center. The holdfast, or a characteristic part of it, should be obtained in the case of all species found attached; and in the case of species not found attached, careful search should be made to discover specimens with the holdfast still on them. Some species, of course, do not grow attached, and consequently have no holdfasts. This should not be taken for granted, however. When the plant is of reasonable size, whole plants should be taken for herbarium specimens; but when plants are too large for this, characteristic portions should be taken, including usually the holdfast and adjacent portion, the tip, and of the middle enough to show method of branching and characteristic fruiting organs if they be present. Fruiting specimens of all larger kinds in which the fruit is of fairly large size, enough so at least to be readily seen with the naked eye or with the pocket lens, should be selected in preference to sterile specimens; or if the fruit is unknown to the collector, large and as promising specimens as possible are to be selected, in the hope that microscopic examination will show them present. Specimens covered with diatoms or other parasites or epiphytes, are to be avoided, when others are to be had, unless they are gathered for the sake of the plants growing on them. The latter may often be, indeed, the more interesting and the rarer of the two. Finally, the specimens taken should be in a good state of preservation. The collector should avoid faded or bleached specimens whenever others are to be had. Specimens which show more or less pronounced symptoms of decay, such as the softening of an otherwise firm species, are usually not worth collecting. These

cautions concern especially those specimens found floating, but apply also, to some extent, to those found attached.

Preparation of Specimens.—If specimens are to be prepared for the herbarium, the process is radically different from that employed if they are to be prepared for the use in the laboratory or for special cytological or histological investigation. For the last two purposes, special methods must be used, varying with the particular species selected and the particular purpose of the investigation. Consequently these methods must be sought for in more extensive works dealing especially with microscopical technique, and also in the various monographs. All that the writer can do is to mention some of the most useful of the methods usually employed for the first two cases mentioned. Plants may be prepared for herbarium service in one of several ways, according to the nature of the plant concerned and the facilities of the collector. They may be rough-dried, mounted upon cards, sheets of paper or mica, or packed away in salt.

Rough Drying.—All the largest algæ, and even all sizes except the very finest, when the collector is on an extended trip and can not obtain the facilities for more careful methods, should be separated carefully from one another and laid out to dry in the air. An old newspaper may be spread out for their reception, and the place to be selected is one not sunny, but at the same time where the air is as dry as possible. The sun dries the specimens too rapidly and renders them too brittle. As the specimens are drying they should be turned over from time to time in order that the drying process may be uniform, and in order that, in the case of large and fleshy specimens, the under moister portion may not mold while the exposed portion becomes so thoroughly dry as to become brittle. Bushy specimens should be shaken out from time to time in order that their branches may dry separately, because, if the branches remain closely adhering to each other, they are very likely to become soft or rotten before they are completely dried. When the specimens are fairly thoroughly dried but before they become brittle they should be rolled up into a ball or roll, and allowed to continue their drying. Finally, each ball or roll should be wrapped up in a piece of dry newspaper, tied up with twine, and is then, if the drying has been thoroughly done, ready for transportation or for

storing until the time when it shall be convenient to soak it out and make it ready for incorporation into the herbarium. Of course, the details of this process will vary with reference to the moistness or dryness of the climate. In the case of the former, it may be necessary to employ artificial heat, especially for the thicker and rougher specimens. At least, especial care will be necessary to make the material dry without molding. In the dry climate, on the other hand, especial attention will be necessary to prevent drying too rapidly. The specimens will become too brittle to handle unless they are watched closely, and they must then be moistened before they can be rolled up into a compact mass for transportation. It is not well to soak or even to rinse the specimens in fresh water before or during the process of rough drying, because they become too brittle and are then transported less safely. The little salt left in them in drying, serves to keep them to some extent flexible, and makes it possible to wrap them up and sort them without breaking them. Specimens prepared in this way and thoroughly and more or less rapidly dried, at least dried without having the opportunity to either rot or mold, may be soaked out in either fresh or salt water, according to the particular species, and will be found to be in excellent condition for ordinary study or for mounting upon paper for preservation in the herbarium. It is best to treat all large specimens, such as Kelps, Rockweeds, Gigartinas, etc., in this way, since if they are placed in press at once, they will be slow in drying until they are dead and are very liable to become moldy, while if they are allowed to die in the open air, the water absorbed in soaking them out will be very quickly given up in the press. The writer has found it to be the only really successful method for large kelps.

Salting.—The use of salt to preserve specimens from the time of collecting until such time as they can be studied has been in use especially among the Scandinavian collectors. Large species as well as extensive collections may be packed away in casks, but finer species, such as can not readily be dried, and even smaller collections, may be packed away in glass jars of larger or smaller size. Especially may delicate filamentous species, such as Callithamnions, Dasyas, Cladophoras, etc., be treated in this way, when there is no opportunity for mounting them at once on paper or

mica. Whether in cask or jar, a layer of salt should be put in, then a layer of algæ, a layer of salt, and a layer of algæ, and so on. Specimens are preserved almost in their original condition, for a very considerable time. This method is especially recommended in cases of expeditions when it is impossible to dry specimens on account of the moisture of the climate, lack of room, or lack of time. In the matter of salt, a fairly fine rock salt is to be used for the larger specimens in the cask and a finer table salt for the more delicate specimens in the jars. Both cask and jars are to be tightly closed, of course, to prevent the leakage of the resulting brine.

Aqueous Preservatives.—Specimens may be preserved for study in sea-water to which a certain amount of camphor gum or formalin has been added. It is not the intention of this article to enter upon any especial discussion of the merits of this part of the subject, but simply to mention that as temporary preservatives both of these substances are often of the greatest use. It often happens that one collects a far greater number of specimens than he can care for immediately, or some interruption occurs and it is necessary to postpone mounting some or all of the specimens until a time more or less remote. If camphor gum is strewn in the dish or formalin added, and the specimens kept in the dark, they will remain in good condition for a number of days and suffer little change even in color. It is well to have the specimens lying in a proportionally large amount of water, or the camphor or formalin may fail in its effect. For laboratory purposes, specimens may remain in formalin solution indefinitely, and if kept in the dark will retain their colors for a very considerable time with but little change. Reds, browns, and blue-greens retain their colors for two years at least, but when exposed to the light, fade quickly. Some reds, such as Porphyras, gelatinize in an aqueous medium, as they do also when being soaked out after rough drying. A little corrosive sublimate in the water will prevent this and unless the specimens are left in too long, it does not affect the color.

Mounting and Pressing.—After the specimens have been collected or preserved in various ways, if they are to be incorporated into the herbarium, they must be pressed. In the case of coarse species, they are to be rough dried first, then soaked out. After

they are soaked out, they may be pressed in a plant press after the fashion of the coarser flowering plants, except that instead of the thin papers between which most of the flowering plants are pressed, the coarse alga must be pressed between pieces of cloth. Fairly coarse, thin cheese cloth will do very well or old linen or muslin that has done service for sheets or pillow-cases. It is important that there should be as little starch as possible in these cloths. The drying paper used may be the ordinary coarse sheathing paper such as is used for flowering plants and which can be obtained from any dealer in botanical supplies, or it may be sheets of fine white blotting paper. The latter is much more expensive and has little advantage over the other. The driers should be changed once a day at least and twice a day is far better, especially at first while the specimens are still moist. If these specimens are large and thick, they may dry very slowly, so slowly in fact that they are in danger of, or perhaps actually do begin to mold. In that case, the writer dips them in alcohol or even in a solution of corrosive sublimate in alcohol, such as is used to poison flowering plants before incorporating them into the herbarium. The solution may be poured into a large shallow dish and the alga dipped into it several times if it is especially large. The alcohol helps to remove the water from the specimen and consequently assists the drying process, while the corrosive sublimate inhibits the growth of the molds. The finer species, lacking the rigidity of the coarser forms must be floated out in water, the cards or sheets of paper brought under them, and then card and specimen lifted from the water in such a way that the seaweed is left spread out upon the card after the fashion in which it grows. The writer finds it most expedient to describe his own method of procedure with fine specimens.

The material, whether fresh, from salt, or just soaked out, must first be sorted, for it is generally either of several species mixed together or of several specimens of the same species mixed together. I use deep crockery baking dishes, which, while yellow outside, are white inside. They are rectangular and about 10x8 inches at the top (inside measurement) and about 2 inches deep. The plants may be sorted from one of these into the other until they are sufficiently separated. For floating out the specimens, I use a method suggested to me by my friend Mr. Isaac Holden, of Bridgeport, Conn.

The utensils are very simple:—a shallow tin pan, such as is used for baking, perhaps 12–14x6–8 inches and from 1–2 inches deep, and a rectangular piece of zinc just a little smaller than the bottom of the pan. If large specimens are to be mounted, of course a larger pan (such as a "dripping pan") and zinc are readily obtainable. The corners of the zinc are bent over at a sharp angle, all on the same side. The piece of zinc is then placed in the pan with the bent portions downwards so as to raise the main portion of the zinc somewhat from the bottom of the pan. Water is then poured in, fresh or salt as the case may be, until it is just the least bit above the surface of the piece of zinc. Take the card or piece of paper, lay it with one surface down in the water, thoroughly wetting that surface, and then turn it over, doing the same thing for the other surface, but leaving the paper upon the surface of the zinc just barely covered with water. Now place the specimen to be mounted, already pruned of superfluous branches and carefully cleaned, upon the paper, and with the forefinger of the left hand gently depress the paper and zinc until the specimen is floating fairly freely. With the right hand, spread out the specimen upon the paper, using a pair of forceps, needles, or a camel's hair brush to assist in the process. When finally spread out, gradually release the pressure upon the zinc, allowing it to rise and drain off some of the water. Then gently raise one end of the zinc until the whole of the specimen is out of the water. As soon as the paper and specimen are drained from the most of the water, remove them from the zinc and place them on an inclined surface to remain until freed from all the superfluous water. When the paper is fairly dry but before the alga has begun to show the effects, the specimen is to be placed upon a sheet of drying or heavy blotting paper, a thin cloth of the kind mentioned above is to be placed over it, another drier upon that, a specimen or layer of specimens upon that, and so on. A flat board with some stones, bricks, or other weights upon it makes the best press. Only a light weight should be placed upon it at first, but after twelve to twenty-four hours, the weight may be much increased. The driers should be changed twice a day if possible, once a day at the very least, as noted above, until the specimens are perfectly dry. Most of the finer specimens will adhere sufficiently to the paper in drying, but some will not. The latter must

be glued onto the paper when completely dry. The floating out should be done in salt water if the specimens are for study. Fresh water, however, will not materially harm most of the marine species, but there are a few which are absolutely ruined by merely being immersed in it. The paper used may be of such a size and such a character as to suit the collector. For ordinary specimens, the writer has found it advantageous to use sheets one-eighth, one-quarter, or one-half the size of the ordinary herbarium sheet. As to quality, a tough, unglazed, fairly translucent paper is most satisfactory, such as decidedly thick typewriter paper for example.

Data.—The data and locality of collection should be most carefully noted in every case. It is also well to keep separate, as far as possible, specimens found floating from those found attached. Floating specimens may often be brought from a considerable distance. Notes as to color, luxuriance, particular habitat, etc., are also often very valuable. All notes as to use, local names for particular species, popular superstitions connected with any form, etc., are also especially worthy of record.

SHORT ARTICLES.

Some Rarities from Wyoming.—On the collecting trip of the past season (1898), quite a number of plants, new to our collection, were secured. At La Plata Mines in the Medicine Bow Mountains especially, were many rare ones collected. The species mentioned below are a few of the noteworthy ones of which Wyoming specimens, now, for the first time, have been added to the Herbarium of the University.

Deschampsia atropurpurea (Wahl.) Sheele. In spruce timber at 12,000 ft. altitude. La Plata Mines, Aug. 27, No. 5201.

Stipa caduca (Beal.) Scribn. A very rare plant; collected on a clayey slope in the Freezeout Hills, July 10, No. 4850.

Carex bella Bailey. No. 5134. This and the three following species of Carex have not been reported from Wyoming before. They were all collected at La Plata Mines in August.

Carex gynocrates Wormsk. This peculiar species was found in a bog, growing in a bed of moss among low willows. No. 5259.

Carex illota Bailey. In dense bunches on the gravelly shore of an alpine lake. No. 5189.

Carex physocarpa Presl. On the shore of a lake. No. 5199.

Scirpus Nevadensis Wats. Collected in wet alkaline soil in central Wyoming. This extends the range of this species considerably eastward. Sweetwater River, July 27, No. 4987.

Chenopodium leptophyllum oblongifolium Wats. Not reported from this state before. On a roadside. Mill Creek, Converse Co., Aug. 12, No. 5048.

Suckleya petiolaris A. Gray. A rare and seldom collected plant; found on an alkali flat along Poison Spider Creek, Aug. 11, No. 5018.

Claytonia megarrhiza Parry. This has not been reported north of Colorado before. The large fleshy root is perfectly white in the interior when fresh, but in drying it becomes purple. La Plata Mines, Aug. 29, No. 5240.

Sedum roseum (L.) Scop. Although this plant has a very extended range, it seems to be exceedingly rare and scattering, at least in Wyoming. Only one specimen secured: La Plata Mines, Aug. 28, No. 5203.

Saxifraga flagellaris Willd. A tiny little plant, growing in shaded nooks between boulders or on an abrupt slope. La Plata Mines, Aug. 29, No. 5237.

Astragalus hyalinus Jones. Very abundant on the sandy plains at the foot of the Seminole and Ferris Mountains in central Wyoming. As seen in the field it is very different from *A. triphyllus*. Its flowers are much less conspicuous, and would hardly be noticed except by an expert eye. The standard is very narrow, while in *A. triphyllus* it is broad and showy. Hitherto only one specimen of this species has been known, that in the herbarium of Dr. Rydberg, collected by him in the sand-hill region of Nebraska. An abundance of material was secured on Bear Creek, July 23, No. 4949.

Gaultheria Myrsinites Hook. From La Plata Mines, Aug. 23, No. 5088.

Chionophila Jamesii Benth. On the bare summits of the range.

Hitherto reported only from Colorado. La Plata Mines, Aug. 28, No. 5206. ELIAS NELSON.

University of Wyoming, Laramie.

TOURIST'S MAP OF MT. TAMALPAIS AND VICINITY.—All lovers of the forests and mountains of Marin County will welcome this valuable map compiled by A. H. Sanborn, C. E., and P. C. Knapp, and issued in 1898. It shows that portion of the country extending from Sausalito to Bear Valley and from the coast inland to Point Reyes Station, Nicasio, and San Rafael.

It delineates wagon roads, railroads, streams, and elevations of all the principal hills and ridges. The scale is four miles to one inch, and the elevations are marked in figures instead of by the conventional contour lines. This makes the country appear flat instead of mountainous, but it is a decided advantage from a practical standpoint, since all the trails and the various points of interest are clearly and accurately shown without the distracting and blurring features of ordinary maps.

The tourists, mountain trampers, and anglers will find it useful, as well as the botanist, who is sure to make use of it in making accurate record of the stations of rare and interesting plants. [A. H. Sanborn, Surveyor's Office, New City Hall, San Francisco; 50c.]

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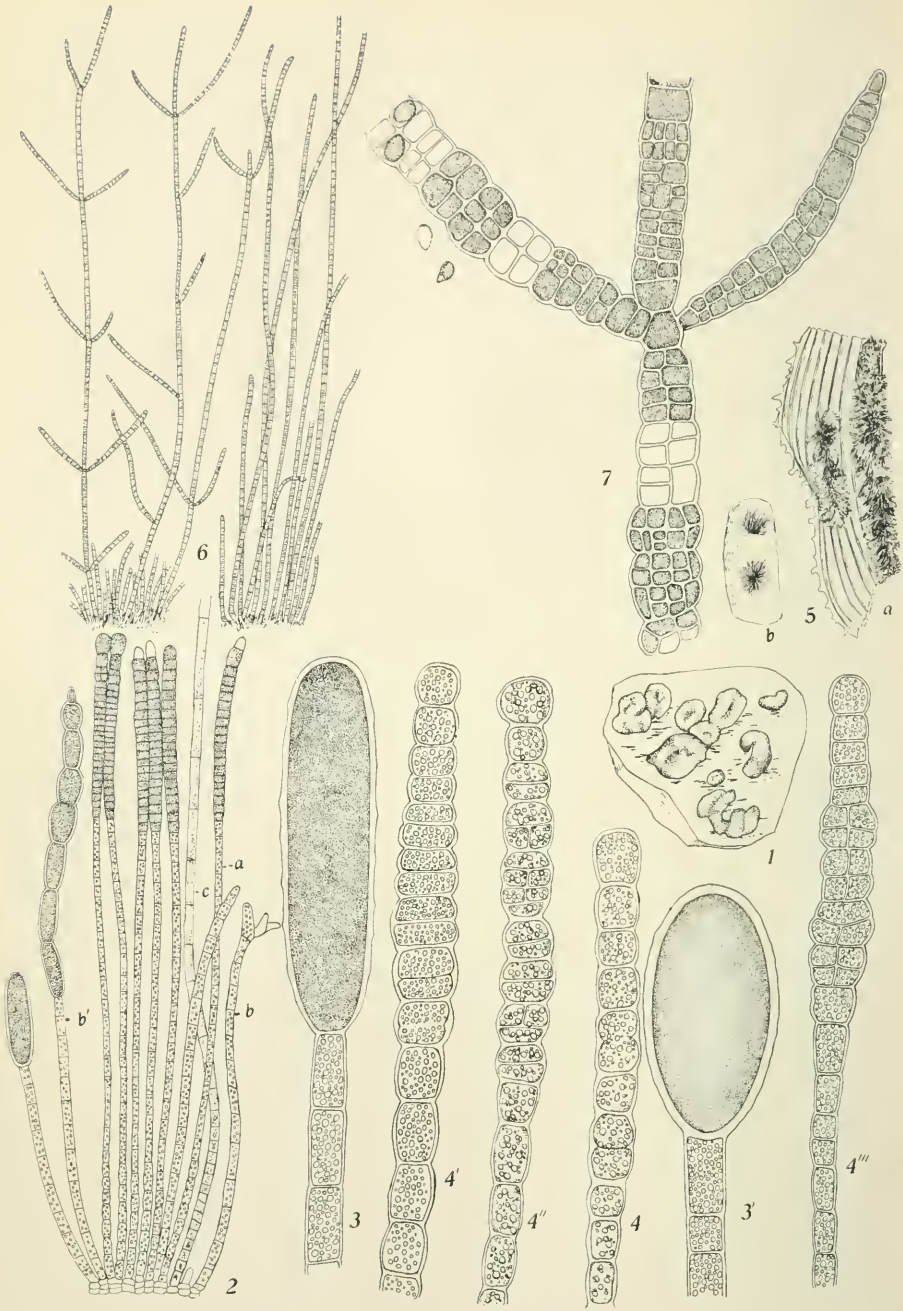

SAUNDERS ON PACIFIC COAST ALGÆ.

NEW AND LITTLE-KNOWN BROWN ALGÆ OF THE PACIFIC COAST.

By De Alton Saunders.

Hapalospongidion. Plant-body of small, rounded, gelatinous, indefinitely-expanded masses, consisting of unbranched vegetative filaments and hairs arising from a basal plate which is two cells thick; plurilocular sporangia formed by the transformation of the upper cells of the longer vegetative filaments; unilocular sporangia arising from the transformation of the terminal cell or cells of the shorter vegetative filaments.

H. gelatinosum. Longer vegetative filaments $\frac{1}{4}$–$\frac{3}{4}$ mm. long; cells of the basal third of the filament barrel-shaped 4–5μ wide, twice as long as broad; central cells of the longer filaments quadrangular, not at all constricted, 5–6μ wide, two to three times as long as broad, increasing slightly in width upward; cells of distal third of the longer vegetative filaments rounded, 7–10μ wide, one-half to as long as broad; plurilocular sporangia not fixed in number, 10–14μ wide, four or eight zoosporangia formed from a single vegetative cell; unilocular sporangia elliptical or oblong, terminal on the shorter filaments, rarely catenulate.

This new alga was collected on rocks which were exposed at low tide, a few rods from the Hopkins Seaside Laboratory at Pacific Grove, California.

The plant consists of irregular, light brown, gelatinous thalli, which are at first only a few millimeters in diameter; later they unite to form indefinite gelatinous masses a decimeter or so in extent and one to three millimeters in thickness. The thalli are composed of erect, unbranched filaments arising from a basal mass which is two cells thick. The vegetative filaments are of two kinds; those which become transformed into plurilocular sporangia are one-third to one-half millimeter in length; the basal third of the filament is composed of barrel-shaped cells 5.5μ broad and twice as long as wide; the central cells of the filament are quadrangular, the walls not at all barrel-shaped, 4 to 6μ wide, two to three times as long as wide, increasing slightly upward; the cells of the distal

third of the vegetative filaments are rounded, 7–10μ wide, one-half to as long as broad, much more densely filled with chromatophores and food granules than the other cells. Those filaments which bear the unilocular sporangia are one-third to one-half as long as those that bear the plurilocular ones; the cells are 7–9μ broad, two to three times as long as broad, the cells of equal width throughout; the terminal cell is neither enlarged nor dark colored. Small clusters of hairs are scattered through the filaments which are a millimeter or so long and 6–9μ broad; the lower cells contain some chromatophores and are twice as long as broad; the upper cells are two to eight times as long as broad.

The terminal cell or cells of the shorter vegetative filaments become transformed into large, very thick-walled unilocular sporangia (Pl. 1, Fig. 2, b & b′). The plurilocular sporangia are formed by the transformation of the upper cells of the longer vegetative filaments (Figs. 4, 4′, 4″ & 4‴). The cells swell up, a partition is formed at right angles to the filament, a second partition is formed at right angles to the first, and the mother cell is thus divided into four zoosporal cells. The emission of the zoospores was not observed. The terminal cells apparently never form zoospores.

The relationship of the plant is plainly with the Elachistaceæ. The growth is apparently basal or sub-basal and the reproductive organs are formed by the direct transformation of the vegetative cells. The genus is in fact closely related to Leptonema of Reinke.* The extreme thickness of the cell wall of the unilocular sporangium might be taken as a suggestion that it, rather than the plurilocular sporangium, is the homologue of the oogone.

Leptonema fasciculatum Reinke. For three successive summers the writer collected small tufts of a light brown alga on *Postelsia palmæformis* Rupr. on all the rocky points where Postelsia flourished and also from plants of the same species washed ashore at various places along the Pacific Coast. Early in the season only sterile material was collected, but late in August abundance of material bearing plurilocular sporangia was obtained. Repeated search for the unilocular sporangia has, however, been made in vain.

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*Atl. Deutch. Meeresalg. 13, tafl. 9–10. Engler u. Prantl, Pfl. Fam., Lief. 86, p. 220, fig. 187. A–C.

It is quite possible that they occur later in the season than the plurilocular sporangia, for it has been impossible to obtain material later than September 1. Although the vegetative filaments and plurilocular sporangia agree with the description and figures of Reinke's *Leptonema*, the unilocular sporangia are necessary to prove the identity of the species.

The plant forms brown, flocculent tufts, 3–12 mm. high on the leaves and stems of *Postelsia palmæformis*. See Pl. I, Fig. 5 a & b. The vegetative filaments are usually unbranched, though a form now and then occurs with short opposite branches at regular intervals (Fig. 6). The cells are not at all constricted at the joints, 7–12μ broad, above as long as broad, below two to three times as long as the diameter. The plurilocular sporangia are formed by the transformation of any or all the cells of the vegetative filaments except the lower; eight, sixteen, or thirty-two zoospores being formed from one of the mother cells. The species also occurs, occasionally, on mussle shells (Mytilus) in the vicinity of tufts of Postelsias. Collected at Point Lobos, Point Cypress, and Point Pinos. July–September.

Agr. College, Brookings, S. D.

EXPLANATION OF PLATE I.

HAPALOSPONGIDION GELATINOSUM D. A. Saunders.

Fig. 1. A piece of rock showing thalli, natural size.

Fig. 2. A part of one of the thalli: a, the longer vegetative filaments; b and b′, shorter vegetative filaments; c, hair, x120.

Figs. 3 and 3′. Two extreme forms of unilocular sporangia, x450.

Figs. 4, 4′, 4″, and 4‴. Different stages in the formation of the plurilocular sporangia, x450.

LEPTONEMA FASCICULATUM Reinke.

Fig. 5. a, a piece of the leaf of *Postelsia palmæformis* showing tufts, natural size; b, a piece of a stem showing same tufts, natural size.

Fig. 6. Two forms of the plant magnified, x100.

Fig. 7. A part of a branched filament showing the formation of zoosporangia.

REVIEWS AND CRITICISMS.

Phycological Memoirs. By De Alton Saunders (Proceedings California Academy of Science, 3d Series, Botany, Vol. I, No. 4, pp. 147–168; Pl. XII–XXXII, 1898).

This is undoubtedly the most important document for the algæ of the West Coast exclusively, since Harvey's paper in the Journal of the Linnean Society, in 1862, on Lyall's collection. It covers the Ectocarpaceæ, Sphacelariaceæ, and Encœliaceæ only; the author's intention is apparently to include all the California species of the last two, but not all of the first, though this is not quite clearly indicated. In all, thirty-five species, varieties, and forms are referred to, all of which are figured. Ten are species already known as occurring on the California coast; eight species, known in other localities, are now first reported in this region; while the following ten species, and seven varieties and forms, are described as new:—Ectocarpus acuminatus, E. ellipticus, E. chitonicolus, E. cylindricus, E. hemisphericus, E. hemisphericus var. minor, E. paradoxus var. Pacificus, E. mucronatus, E. corticulatus, E. siliculosus var. parvus, E. confervoides var. variabilis, Pylaiella littoralis forma densa, P. littoralis var. (?), Sphacelaria didichotoma, Scytosiphon bullosus, Colpomenia sinuosa forma expansa, C. tuberculata.

Diagnoses are given of all species, also of the genera and families, and keys to the genera of each family; the descriptions are clear and concise, the plates well executed and characteristic. It might have been better if the author had given fuller notes, critical and general, especially with the new species; the genus Ectocarpus is a large one; many species are imperfectly known, and new species are being continually described; all details that can be given, and especially indications of affinities and dissimilarities, as compared with known species, are needed.

Whether all the forms described will prove to be new, is uncertain.

Sauvageau, Kuckuck, and Rosenvinge have done much within the past few years towards clearing up the doubtful old species and distinguishing new forms, but there is no reference to them in this paper. Sauvageau's work is especially important in comparison; most of it has been done in the Bay of Biscay; and, though at first sight it would seem unlikely that there was much in common between these localities, in reality many species occur in both. *E. Mitchellæ* is common on the French Coast, as well as on the Atlantic Coast of the United States; perhaps, however, this should be considered as a cosmopolitan species; certainly it should be if *E. Indicus* Sonder is a synonym, as Mr. Saunders claims. But there are two other Ectocarpus species, not included in this paper, which have been recently found in Southern California, and which are found also on the French coast, though not on the east coast of America.

In regard to individual species, some comments may be made. *Phycocelis reptans* (Crouan) Kjellman is properly described as having erect filaments unbranched, but in Pl. XII, fig. 10, we find one filament with an abundance of short branches. *P. fœcunda* Strœmf. is described as having uniseriate plurilocular sporangia; this does not agree with the type, but with var. seriata Reinke.* But there is a possibility that the plant observed by Mr. Saunders may be neither type nor variety; for the figure would pass very well for *Myrionema vulgare* Thuret.

Ectocarpus chitonicolus in Pl. XV, Figs. 2, 3, and 4, has plurilocular sporangia so different in appearance as almost to suggest that there was more than one species concerned; as the text contains no information in regard to figures other than is given by the plates themselves, we can only conjecture as to the causes of the difference. May it not be possible that we have here the two forms of plurilocular sporangia described by Sauvageau? † In that case Fig. 2 would represent the megasporangia; Fig. 4, the meiosporangia; Fig. 3, however, seems abnormal. The author reports no observations as to the formation and emission of the zoospores; it would

* Reinke, Atlas Deutscher Meeresalgen, Pl. XVI, 1889.

† Sauvageau, Sur l'Ectocarpus virescens, Jour. de Bot., Vol. X, p. 17, 1896.

be interesting to know if the distinction observed by Sauvageau holds good in this species. Mega- and meio-sporangia have been observed in *E. Mitchellæ* Harv. (*E. virescens* Thuret), by Mrs. E. Snyder, at La Jolla, California.

E. corticulatus presents a curious feature in the "apparent" occurrence of plurilocular sporangia on the corticating filaments; if this proves to be the case, the plant is of special interest.

E. confervoides forma *variabilis* is described as having seriate unilocular sporangia on the same filament as plurilocular sporangia of the usual form. No reference is made to previous observations of these formations, and the discussion they have caused. The first notice appears to have been by Rosenvinge, ‡ who considered them, as does Mr. Saunders, as unilocular sporangia. Kuckuck § then observed them, and suggested that they were probably plurilocular sporangia arrested in growth, and taking on an abnormal form. Sauvageau || referred them to a parasitic origin of a Chytridiaceous character; and Rosenvinge ¶ now accepts this view, except that he finds the parasite to be rather a Vampyrella than a Chytridium. As these formations are found in other species as well as in *E. confervoides*, the form hardly deserves a special name.

The Encœliaceæ in this paper present little opportunity for criticism; the habit figures are excellent, and with the anatomical figures make plain enough the differences between the genera; as each genus has only one or two species in Californian waters, there should be little difficulty now in their recognition. Of the genera into which Agardh has divided the old Punctaria, Homeostroma has been taken for the Californian plant which would have been called *P. latifolia;* the new genus Halorhipis is proposed for the *Punctaria Winstonii* of Dr. C. L. Anderson.

The paper contains some errors for which the printer is probably responsible: "Long and colorless hairs are born on the branches" (p. 149); "forming a rope-like, spongy mass" (p. 155); "twice

‡ Rosenvinge, Gronlands Havalger, p. 883, 1893.

§ Kuckuck, Wissenchlaftliche Untersuchungen, p. 234, 1894.

|| Sauvageau, Sur les Spores en Chapelet de l'Ectocarpus confervoides; Jour. de Bot., Vol. X, p. 41, 1896.

¶ Rosenvinge, Deuxième Memoire sur les Algues de Groenland, p 76, 1898.

dichotomus" (p. 158). Perhaps, however, we might do the printer an injustice in making him responsible for the following, under *Sphacelaria didichotoma*, "stalk 2–300μ long, main branches 100–200μ long," which is quite a range for the stalk. Under *Ectocarpus Mitchellæ* "main filament 25–40μ wide, 1–3 times as long as the diameter." Under *Homeostroma*, "paraphyses none, furnished with numerous clusters of hairs."

In conclusion, the points in which the paper might be open to criticism are, lack of reference to the latest studies on the Ectocarpaceæ; scantiness of detail as to new species; and some little inaccuracies that might have been corrected in the final revision for the press.

On the other hand, the clear and concise descriptions are very refreshing after wading through works where the author seems to think that if he can only repeat a statement often enough, he can consider it proved. Whether all the proposed species hold good or not, the paper is a valuable contribution to our knowledge of the Californian algæ.—F. S. C.

SHORT ARTICLES.

Concerning Stapfia, Davy.—Dr. Stapf and Dr. Howe have kindly called my attention to the preoccupation of the name Stapfia, by Prof. Chodat in Bull. L'Herb. Boiss. 5, 939, pl. 23, Nov., 1897, for a genus of green algæ (Palmellaceæ). I therefore propose the name **Neostapfia colusana** for *Stapfia colusana* Davy, Eryth. 6, 110, Nov., 1898.—J. Burtt Davy.

Toyon Berries in the North Coast Ranges, California.—While driving through the Vaca foothills of Solano County in December, 1898, it was noticeable, notwithstanding the long prevailing dry season, that the Toyon berries (*Heteromeles arbutifolia* Roemer) were decidedly larger than in previous years. I also noticed that which I had not observed before, namely, two different types of inflorescence, a flat-topped sort and a looser paniculate kind. My attention was attracted to them by the fact that the latter were of a bright red color, while the former had a distinctly yellowish cast.—R. H. Platt.

NEWS NOTES AND CURRENT COMMENT.

Prof. De Alton Saunders, of the South Dakota Agricultural College at Brookings, devoted the midwinter months to the collection of marine and fresh-water algæ in the gulf coast region of the Southern States.

During the next season Prof. Aven Nelson, of the University of Wyoming, proposes to collect extensively in the Yellowstone National Park and the adjacent Forest Reserves. Orders are asked in advance for the sets, which "are to be 20th century plants, with all that that implies." Students and others interested in the Rocky Mountain flora may address Prof. Nelson at Laramie.

Dr. Edwin B. Copeland was appointed in December, 1898, by the trustees of the State Normal School at Chico, California, to take charge of the instruction in botany in that institution. Dr. Copeland took his bachelor's degree at Stanford University in 1895, and received his doctor's degree from the University of Leipzig in 1896. Later he accepted a position in the Department of Botany at Indiana State University, but at the outbreak of war in 1898 resigned in order to enlist in the Wisconsin Volunteers.

Dr. D. T. Macdougal, for six years in charge of physiology at the University of Minnesota, has within a few weeks been appointed Director of the Laboratories of the New York Botanical Gardens in New York City. We also learn through a private letter that Dr. John K. Small has been appointed Curator of the Herbarium in the same institution, and that Dr. M. A. Howe has succeeded to the curatorship of the Herbarium of Columbia University made vacant by the resignation of Dr. Small. It is to be inferred, therefore, that the proposed transfer to the botanic garden of Columbia's Herbarium of "over six hundred thousand specimens" and botanical library has not taken place.

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EDITED BY

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Nostoc amplissimum Setchell.

NOTES ON CYANOPHYCEÆ.—III.

BY W. A. SETCHELL.

Calothrix parietina (Næg.) Thuret is a very variable species, as is clearly set forth by Bornet and Flahault (Rev. Nost. Het.; I, 367), yet it is fairly easily recognized when its chief characteristics are once determined. Farlow was the first to publish it from North America. He found it growing in Nobska Pond, near Wood's Hole, Mass. (cf. N. E. Algæ, 40). Since then it has been found in various places in Massachusetts, Connecticut, and California by the writer and others. It has been distributed from this country under the following names:—

Calothrix parietina, Holden, Phyc. Bor.-Amer., No. 12. Tilden, Amer. Algæ, No. 164.

Porphyrosiphon Notarisii, Tilden, Amer. Algæ, No. 65.

Dichothrix Utahensis, Tilden, Amer. Algæ, No. 288.

Calothrix thermalis, Tilden, Amer. Algæ, No. 287.

Wolle has also distributed specimens under the name of *Mastigonema cæspitosum* (No. 18), and there is little doubt but that this is the form referred to by him under this name in the Bulletin of the Torrey Botanical Club for 1877 (6, 138) and also under the name of *Isactis cæspitosa* in his Fresh Water Algæ of the U. S. (p. 245, pl. 176, f. 5 and pl. 178, f. 1–3.)

C. parietina may be entirely free from incrustation, or it may be very thoroughly incrusted with either lime or silica. It is seldom, if ever, branched, but the hormogonia in the incrusted specimens attach themselves very often to the sheaths of the older filaments and resemble branches very strongly indeed. Intercalary heterocysts do occur in *C. parietina*, but they are not at all common. The species is usually readily distinguished by its lamellose, brown, and more or less ochreate sheath, but these characters may be at times more or less obscure.

Contributions from the Botanical Laboratories of the University of California, No. 5.

Calothrix Braunii B. & F., found fairly abundantly in New England and distributed from there by Holden (Phyc. Bor.-Amer., No. 112), has been found in the State of Washington by Miss Tilden (Amer. Algæ, No. 286b). No. 286a, however, as far as the writer's copy of the American Algæ is concerned, is not *C. Braunii*, but a species of Tolypothrix. The writer feels fairly certain in referring also to *C. Braunii*, the *Isactis cæspitosa forma tenuior viridis* of Wolle's Fresh Water Algæ of the U. S. (p. 245, pl. 178, fig. 1–3, & pl. 205, fig. 6, 7, 1887), although the latter figures are referred to *I. fluviatilis* in the explanation to the plates. *C. Braunii* does certainly resemble *Isactis* in its habit very much indeed.

Calothrix adscendens (Næg.) B. & F. has never been reported from this country. A specimen distributed by Wolle under the name of *Mastigonema parasiticum* Wolle, appears to be this species. The specimen is number 83 of Wolle's Fresh Water Algæ of the United States (Exsicc.), but the writer is unable to find any description of this species in any of Wolle's published writings. The filaments grow in stellate clusters, epiphytic on threads of Œdogonium and Bulbochæte. They are somewhat enlarged at the base and are from 20 to 24μ in diameter about half way up. The sheath is colorless, thick, more or less stratified, and often beautifully ochreate below. The heterocysts are basal and, in the material examined, almost uniformly two, the lower one being smaller and spherical, and the upper one larger and oblong. The cells of the trichome are from one-half to nearly twice as long as broad, have brown contents, and are about 12μ in diameter. The terminal hair is very short. The writer has been unable to compare this material with authentic specimens, but the agreement with the description in Bornet and Flahault is so exact as to leave little room for doubt.

There is no mention of locality on the label of Wolle's specimen, but it probably came from Pennsylvania or New Jersey.

Calothrix parasitica (Chauvin) Thuret not uncommon on the coasts of Southern Europe and of New England, has been found at San Diego and San Pedro, California, growing within the fronds of *Nemalion multifidum* and *Helminthocladia purpurea*.

Dichothrix compacta (Ag.) B. & F. is not always readily to be distinguished from *D. gypsophila*. It is said to resemble *Calothrix parietina* in every way except that it has the branching of the genus *Dichothrix*. It is shorter than *D. gypsophila*, and has the cells of the trichome usually shorter, rather than longer, than broad. A specimen from Samuel B. Parish, collected at San Bernardino, seems to agree very well with the description of this species. The sheaths are yellowish-brown, lamellose, more or less dilated towards the summit, but, at the very summit, are usually contracted again very suddenly.

Mastigocoleus testarum Lagerh. does not seem to be at all plentiful in shells along the Californian coast, nor do any other shell-boring algæ appear to be so common as such forms are along the Atlantic Coast of New England. This species, however, has occurred to the writer in small quantity, growing in the shells of the Eastern Oyster near Bay Farm Island, Alameda County, California.

Hapalosiphon laminosus (Kuetz.) Hansgirg is common in the waters of the Arrowhead Hot Springs, near San Bernardino, in company with other characteristic thermal algæ. It does not seem to differ in any essential respect from specimens from Carlsbad, distributed in Wittrock and Nordstedt's Exsiccatæ (Nos. 758 and 759). It seems to be the same as *H. major* Tilden, for, while the measurements of that species are said to reach 11μ, the writer has been unable to find trichomes over 9μ in his copy of the American Algæ (No. 167) and also was able to find equally broad trichomes in the specimens from Carlsbad. These were exceptionally broad trichomes, however, in both cases, the general average being the same in both and in perfect agreement with the figures given by Bornet and Flahault.

Stigonema hormoides (Kuetz.) B. & F. is readily told from the forms of *St. minutum* (Ag.) Hassall by the fact that it has, as a rule, only a single row of cells even in the main filament, while the latter species has from two to four cells in each articulation, yet Wolle has distributed the former under No. 30 of his distribution

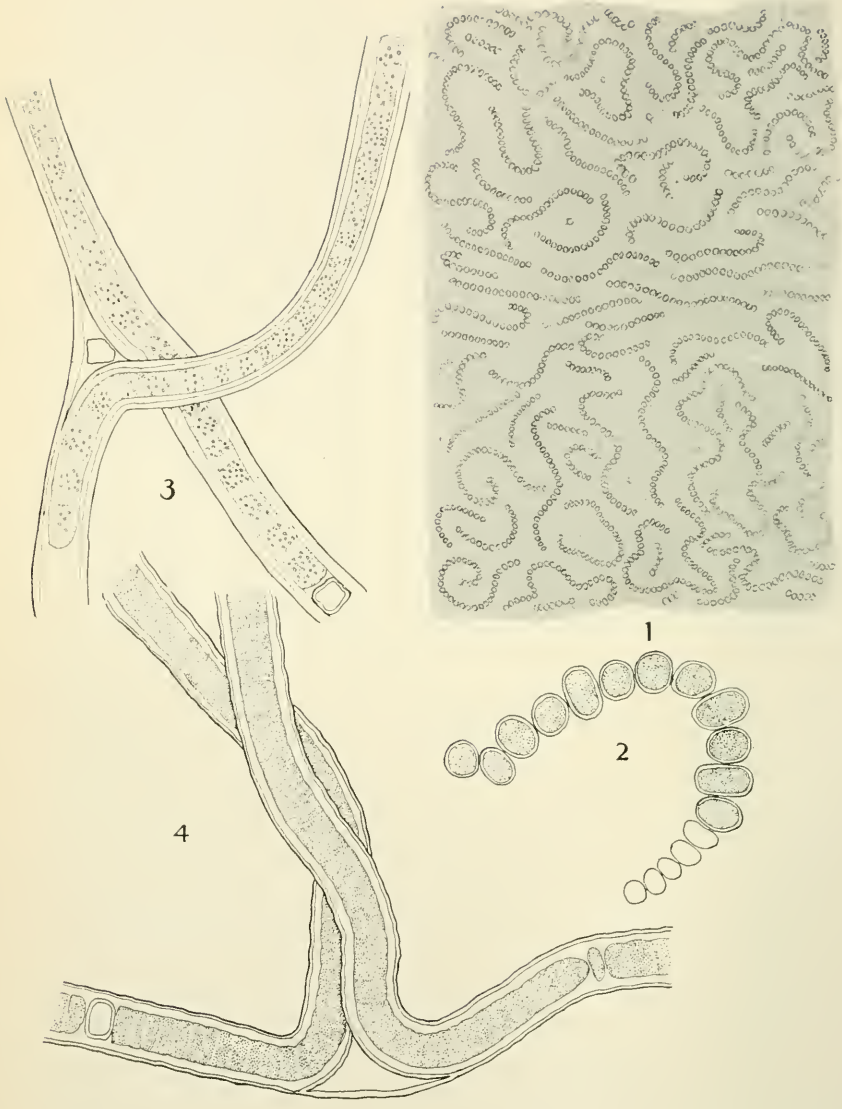
and sent out the latter, received from Ravenel—both under the name of *Sirosiphon compactus*. Mr. Wolle has devoted considerable attention to the Sirosiphoniaceæ in his various writings, but it certainly seems that his ideas of specific limitations were very uncertain, so much so in fact that it will be very difficult to arrange his references under any satisfactory citation of synonymy.

Stigonema ocellatum (Dillw.) Thuret is another case in point. This species was sent out by Wolle labeled *Sirosiphon Crameri*. Bornet and Flahault place *Sir. Crameri* Brugg. among the "species inquirendæ."

Scytonema mirabile (Ag.) Bornet, found in New England by Farlow (B. & F., Rev. Nost. Het., III, 103), at Niagara Falls by Wolle (Setchell, ERYTHEA, 4, 193), and by the writer, at Manitou, Colorado (l. c., 4, 89), is distributed from Iowa in Tilden, American Algæ, No. 290, under the name of *Scyt. Myochrous*.

Scytonema densum (A. Br.) Bornet, found by Wolle at Niagara Falls (Setchell, ERYTHEA, 4, 191), has been found near Twin Oaks, San Diego County, California, by F. W. Koch. Dr. Bornet, who determined the specimen, says that it has all the characteristics of *Scyt. densum* except the gelatinous sheath, but that even the sheath in some places has the characteristics of the type.

Scytonema caldarium sp. nov. The algæ inhabiting the hot springs and their vicinity are always of especial interest as to their likeness or unlikeness to forms found either in similar places elsewhere or to those found entirely apart from thermal activity of any kind. The specimens which are taken as the type of the species to be described below, were collected at the Waterman Hot Springs near San Bernardino, California, by Samuel B. Parish, April 9, 1897. Mr. Parish has collected the same thing in the same localities many times previously, and through his kindness, the writer also has had the opportunity of collecting it at the same place. The alga forms more or less extended tufts on the cooler portions of the rocks from which the hot water drips and the temperature of the tufts approximates to 27° C. The filaments of *Scyt. caldarium* are decumbent or even horizontal at the base, more



A. A. LAWSON, DEL.

SETCHELL ON CYANOPHYCEÆ.

ERYTHEA, VOL. VII,
PLATE III.

or less intertwined and about 16μ in diameter. These basal filaments branch in a geminate fashion and the branches are erect and twisted together into Symplocoid tufts, 8–15 mm. high. The erect filaments, seldom or only singly branched, are 12–16μ in diameter. The trichomes, 4–8μ in diameter, are olivaceous to yellow-green. Cells from one-half to three times as long as broad, 4–8μ broad and 3–12μ long, uniformly coarsely granular. Heterocysts from discoid to quadrate in the younger parts of the filaments, to cylindrical in the older parts, colorless. Sheaths firm, stratified with parallel layers, colorless, soon becoming deep yellowish brown.

This species is most nearly related to *Scyt. ocellatum* Lyngb. but differs from it in habit, height, proportional length of cell and character of heterocyst (cf. Plate III. fig. 3).

Scytonema occidentale sp. nov. The material, upon which the new species here proposed is based, was collected on one of the earliest collecting trips taken by the writer in California. It grew upon the bare smooth rock bed of La Jota Creek, just above the Falls, on Howell Mt., near St. Helena, Napa County. There was not very much of it and it formed tufts of a somewhat rigid consistency and of a decidedly black color. The filaments are decumbent at the base and branched in the characteristic Scytonematoid fashion. They measure 36μ in diameter. The branches are usually in pairs, erect and flexuous, 21 to 27μ in diameter, and either free or included for a longer or shorter distance within a common sheath. The sheaths are thick, gelatinous, rugose, and made up of parallel layers, of which the innermost turn blue with the Chlor-Zinc Iodine. The trichomes are 18–30μ thick and of a grayish violet color. The ordinary cells of the trichome are 9–12μ long, but those of the hormogonia are much shorter, being at times as short as 3μ. *Scyt. occidentale* belongs clearly to the subgenus Euscytonema of Bornet and Flahault and comes nearest to *Scyt. stuposum* (Kuetz.) Bornet, but differs from it in the shorter cells of the trichome. Dr. Bornet has kindly pointed out the distinguishing characteristics of the species and has embodied them in the following Latin diagnosis: —

"Cæspitosum, e filis basi decumbentibus pseudoramosis (36μ crassis), ramis sæpius geminis, erectis, flexuosis (21 ad 27μ crassis),

liberis vel inferne vagina communi plus minus longe inclusis; vagina crassa gelatinosa rugosa. Trichomatibus 18–30μ crassis, griseo-violascentibus; articulis 9–12μ longis (in parte hormogonigena 3μ tantum longis)."

Nostoc amplissimum sp. nov. The specimens upon which the new species, here proposed, rests, were collected near Pasadena, California, by Prof. A. J. McClatchie, in the spring of 1896. It grows in streams, attached to stones, and reaches a considerable size. The thallus is at first spherical, becomes very early hollow and lobulated, expanding until it becomes an irregular, verrucose, brownish yellow sack, measuring as much as 60 centimeters by 30 centimeters. This species is therefore the largest species belonging to the Cyanophyceæ. The wall of the sack is of varying thickness, from 2 to 10 mm., and composed of one to several layers of jelly in which the trichomes are imbedded. The structure of the wall is not altogether simple, it seems to contain small, flattened cavities. These cavities remind one of the figure of *Nostoc parmelioides* by Gomont (cf. Bull. Soc, bot. de France, 43, pl. 10, fig. 7, 1896), but in that species the cavity is the only cavity of the plant, while in ours there is, besides these smaller cavities, the huge main cavity. The wall, too, contains abundant small lumps of lime. The filaments are very numerous in the jelly and arranged somewhat variously. Near the surface, both upper and lower, they are much contorted, while in the middle, they take more nearly a horizontal and parallel course. The trichomes of the outer filaments are provided with conspicuous, wide, brown sheaths, those of the lower often have distinct colorless sheaths, while those of central portions seldom show any indication whatever of sheaths. The trichomes, themselves, are always more or less torulose and the cells vary from depressed spherical to short cylindrical and measure 2–3μ in diameter and 3.5-5μ in length. The heterocysts are somewhat larger than the cells of the trichome and measure, usually, about 4μ in diameter. The spores begin to form in the outer layer, as a rule, and are from 5 to 6μ long and from 3 to 4μ thick. The spore-forming cells elongate perpendicularly to the length of the filament, as is shown in figure 2 of Plate III. The spores are

ellipsoidal, and possess a smooth, brown membrane. They are produced in abundance in older plants.

This species very strongly resembles *Nostoc verrucosum* (L.) Vaucher in habit and habitat, but reaches a much larger size and has trichomes which are always distinctly torulose instead of being most distinctly cylindrical, as is the case in *N. verrucosum*.

The types of the species are several plants chosen from some ninety specimens collected all at the same time and place by Prof. McClatchie and seemingly exactly the same. What appears to be the same species has been collected in quantity by the writer at Hollister, California. The specimens were found in all stages of development, growing in watering troughs supplied from artesian wells. Sets from both localities will be distributed in the twelfth fascicle of the Phycotheca Boreali-Americana.

Anabæna variabilis Kuetz. was mentioned by the writer as being new to North America in 1895 (cf. Bull. Torrey Botan. Club, 22, 429). It has also occurred to him at San Francisco, California. Miss Tilden has distributed under this name (cf. American Algæ, No. 169) three specimens, all of which are Nostocs of the *Intricata*-group. No. 169b is *N. Linckia* but the other two are not so readily determinable. They seem most like *N. piscinale*.

Anabæna oscillarioides Bory, while not credited to North America by Bornet and Flahault, except as to the variety *stenospora*, is probably not uncommon. The writer has it from Woods Hole, Mass. (J. E. Humphrey and K. Miyabe), from Bridgeport, Conn. (Isaac Holden), from Evanston, Ill. (L. N. Johnson), from Helena, Montana (F. D. Kelsey), and from San Francisco, California (W. A. S.). Miss Tilden has distributed it under the name of *Nostoc spongiæforme* from St. Paul, Minn. (cf. American Algæ, No. 83), but her number 87 is clearly *Cylindrospermum majus* although labeled *A. oscillarioides*.

Cylindrospermum majus Kuetz. is probably common over the entire country. It often appears in American collections under the name of *C. flexuosum*, a name given to it by Wolle. He has distributed it under that name as No. 57 of his distribution. It is also No. 87 of Miss Tilden's American Algæ as mentioned above. Speci-

mens of this number were examined, both from the writer's own copy and from the copy in Herb. Farlow. The plant distributed is undoubtedly a Cylindrospermum. No ripe spores were seen attached, but many were intermixed in the material. They were the characteristic rough spores of *C. majus* as were also the attached, unripe but still ventricose spores. *C. majus* has been distributed from Connecticut by Holden (cf. Phyc. Bor.-Amer., No. 106) and has been collected in California by a number of people.

Cylindrospermum licheniforme (Bory) Kuetz. occurred to the writer, growing upon a bank within reach of salt spray, at Bolinas, Marin County, California. The determination was kindly confirmed by Dr. Bornet. It has been credited to North America heretofore, only from New York. (cf. Atkinson, Phyc. Bor.-Amer., No. 309.)

Schizothrix Mulleri Næg. was credited to the United States on authority of a specimen in Herb. Thuret, collected by Farlow. Since then, it has been found at Saugus, Mass., by Collins (cf. Phyc. Bor.-Amer., No. 7) and at Mount Carmel, Conn., by the writer. It was also found, growing in considerable abundance, along the banks of a small stream on Howell Mt., near St. Helena, Napa County, California, by the writer, in February, 1896. The latter specimens recall those of the Abbe Hy, mentioned by Gomont in a note appended to the description of the species in his Monograph. In some parts of the material, all the trichomes are solitary in the sheaths, while the sheaths themselves are colorless or light yellow, thin and papery, and seldom showing even a trace of stratification. In other parts of the specimen, however, the typical form of the species is met with. The trichomes have exactly the same characteristics as regards shape of cell, terminal cell, etc., but the sheaths are all gelatinous, stratose, and of the normal golden yellow color. The thin, colorless sheaths gave no blue reaction with Chlor-Zinc Iodine and the gelatinous sheaths turned blue only after some time and even then faintly and without uniformity.

Microcoleus lacustris (Rab.) Farlow was known to Gomont, only from Newton, Mass., where it was collected by Farlow. Holden has since collected it in Connecticut (cf. Phyc. Bor.-Amer., No. 307), and it has been distributed by Wolle under the name of *Phormidium*

congestum. Wolle's specimens, being without special locality, were probably collected in Pennsylvania.

Microcoleus paludosus (Kuetz.) Gomont, not hitherto credited to the United States, has been found in Rhode Island by W. J. V. Osterhout, in Southern California by Parish, and is at times more or less common in the green-houses of the University of California at Berkeley.

Symploca muscorum (Ag.) Gomont is quite common in the Redwood region to the north of San Francisco Bay, where it has been collected by Messrs. Howe, Davy, and the writer. It has been distributed by Miss Tilden under No. 66 of the American Algæ, but with no definite locality given.

Phormidium inundatum Kuetz., attributed to this country on the authority of a specimen collected by Farlow, has been distributed by Wolle (No. 108) under the name of *Oscillaria antliaria*.

Phormidium autumnale (Ag.), Gomont, undoubtedly common over the whole country, has been distributed by Wolle as a variety of *Oscillaria violacea*. It is not always an easy matter to distinguish this species from *Ph. uncinatum*, but No. 295 of Miss Tilden's American Algæ, seems to be *Ph. autumnale* rather than *Ph. uncinatum*.

Oscillatoria sancta Kuetz., not credited to North America by Gomont, has occurred in several parts of the United States considerably distant one from the other. A. K. Harrison has found it at the bottom of a warm spring at Lebanon Springs, New York, and it has been found by the writer at the bottom of a cold stream near Oakland, California. It is rather too common, on earth, among flower pots in the conservatories at the University of California at Berkeley (cf. C. P. Nott, Phyc. Bor.-Amer., No. 500) and it has been found under the same circumstances at St. Paul, Minnesota, whence it has been distributed under the name of *O. limosa*, by Miss Tilden (cf. American Algæ, No. 73). It is a very distinct species and may be readily told by its peculiar attenuate and capitate, calyptrate tip. Gomont's figure is most characteristic.

Oscillatoria limosa Ag. is a common species. At least it seems to occur wherever the collecting has been at all extensive. It is

credited to the United States by Gomont on the authority of specimens collected by Farlow, Collins and Holden. It was distributed by Wolle, presumably from Pennsylvania, under the name of *Oscillaria Frœhlichii* and its variety *viride*. The species has been found in several places in California by Messrs. Howe, Parish, McClatchie, and the writer, and in Minnesota by Miss Tilden (cf. No. 72 American Algæ).

Spirulina major Kuetz. is not credited to the United States by Gomont, but has since been found in California by Parish and McClatchie, in South Dakota by Saunders (cf. Phyc. Bor.-Amer., No. 501), and has been distributed from Minnesota by Miss Tilden under the name of *Sp. subsalsa* (cf. American Algæ, No. 79).

Chroococcus turgidus (Kuetz.) Næg. is undoubtedly common all over California, having been collected in a number of widely separated localities by the writer and by others. It occurs in fresh, brackish, and even in somewhat alkaline waters.

Gomphosphœria aponina Kuetz. has been collected in California, near Los Angeles, by Miss Sarah P. Monks.

Pleurocapsa fuliginosa Hauck, known from Europe and New England, has been found in abundance by the writer at San Francisco, on the piles of the wharf at the Life Saving Station at the Presidio, on old timbers at Alameda, and upon smooth rocks at Carmel Bay, in Monterey County. It has not been credited to the Pacific Coast before.

Xenococcus Schousbœi Thuret occurred to the writer at Carmel Bay in Monterey County, growing abundantly on the filaments of *Calothrix crustacea* Thuret.

Dermocarpa prasina (Reinsch) Bornet occurs upon various algæ on the coast of California. Species of Dermocarpa are very common, but have not, as yet, been at all carefully collected and studied. The most common one, however, seems to be *D. prasina*.

Hyella cæspitosa B. & F. does not seem to be at all common on the coast of California, at least as compared with the coasts of Europe and New England. It does occur, however, in abundance,

near Bay Farm Island, in Alameda, but only on shells of the Eastern Oyster (*Ostræa Virginiana*). It seems quite probable that it may have been introduced.

EXPLANATION OF FIGURES.

PLATE II.

Photograph of fresh plant of *Nostoc amplissimum* Setchell, collected by A. J. McClatchie near Pasadena, California, in the spring of 1896. The reduction is a little less than one-half the linear dimension, as may be seen from the scale of inches at the side.

PLATE III.

1. *Nostoc amplissimum* Setchell. Transverse section through the frond of a specimen in vigorous vegetative condition, showing the arrangement and shape of the trichomes. Magnified about 40 x.

2. *Nostoc amplissimum* Setchell. Spore bearing filament with a few sterile cells at the end. Magnified about 1,200 x.

3. *Scytonema caldarium* Setchell. Portion of a filament showing characteristic structure and branching. Magnified about 500 x.

4. *Scytonema occidentale* Setchell. Portion of a filament, showing characteristic structure and branching. Magnified about 400 x.

SHORT ARTICLES.

The Washington Botanical Club.—This organization dates from an informal gathering of botanists held at the residence of one of its members November 11, 1898. The limit of membership was fixed at twenty; and it was determined that the meetings should be, for the present at least, of a distinctly social and informal nature, with free scope for discussion and the general interchange of ideas. At a subsequent meeting held December 14, the organization was perfected by the election of Prof. Edward L. Greene as President and Mr. Charles Louis Pollard as Secretary. The Club is to hold monthly sessions, devoting itself chiefly to systematic and ecological work, the field of physiology and vegetable pathology being covered by the already existing Botanical Seminar.

At the December meeting the following resolutions, commemorative of the late Gilbert H. Hicks, were unanimously adopted and

ordered printed in the leading botanical journals of the country:—

"It is with extreme sorrow and heartfelt regret that we learn of the death of our friend and colleague, Mr. Gilbert H. Hicks. To all of us he was known intimately as an earnest co-worker in the field of science, and a genial member of our social organizations. His energy, earnestness, and conscientiousness in scientific work commanded our approval, and secured recognition for him in all scientific circles as an able investigator. He had already done much to advance knowledge in his chosen line of work, and we feel that the cause of science has lost greatly by his untimely death.

"Much of his work, though of a high scientific character, had been so directed as to yield results of the greatest practical value in the production of food crops, and was intended to lighten in some degree the burden of struggling humanity. As a botanist, his keen appreciation of practical problems and his extensive knowledge of plant life well fitted him for this work for the people; and not only has science lost by his death, but all tillers of the soil, those who plow, sow, and reap, have lost a true friend and counselor.

"Yet to us, his daily associates, the loss is greatest. We shall miss his cheery greetings, his companionship, his counsel. It is thus with feelings of deepest sorrow and regret that we have learned that he has been taken from us while yet in the prime and vigor of early manhood. To his sorrowing family we desire to express our heartfelt sympathy and condolence. We realize how inexpressibly great the loss has been to them, and we mourn with them.

"*Resolved*, That a copy of the above resolutions be sent to the family of the deceased, and to the various botanical magazines of this country."

CHARLES L. POLLARD,
Secretary, Washington Botanical Club.

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ERYTHEA

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EDITED BY

WILLIS LINN JEPSON,

Instructor in Botany, University of California.

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THE WESTERN SPECIES OF ARAGALLUS.—CRITICAL NOTES AND NOVELTIES.

By Aven Nelson.

Being located in the very heart of the range of the western members of the genus Aragallus, the writer has had exceptional opportunity for the accumulation of a considerable series of specimens of some of the species; the following notes upon them as to distribution and relative abundance, together with descriptions of some new species, may be, therefore, of interest to students of this group.

1. Stipules free; pod 1-celled.

Aragallus deflexus (Pall.), Heller, Cat. N. A. Pl. 4 (1898). *Oxytropis deflexa* D. C. of most American authors. This species, abundant and widely distributed in western North America, is rarely, if ever, confused with other forms.

2. Stipules adnate to the petiole; leaves simply pinnate.

*Calyx inflated, sub-globose; pod included.

Aragallus multiceps (Nutt.), Heller, Cat. N. A. Pl. 4 (1898). *Oxytropis multiceps* Nutt.; T & G. Fl. N. A. I, 341 (1838). In the specimens at hand the caudex is truly multicipital; perhaps more cæspitose than in the original specimens. In all its forms it is a rare plant, occurring usually on stony or gravelly hillsides at middle elevations and not, as usually stated, in the alpine regions of the Rocky Mountains.

Aragallus multiceps **minor** (Gray). *Oxytropis multiceps minor* Gray, Proc. Am. Acad. XX, 2 (1884). The later lists of plants have ignored this variety, but a fair series of specimens of the species shows that the variety as represented by the Hall and Harbour plants, No. 144, may well stand.

Aragallus collinus. Tufted on the summit of a stout, woody root, the short branches of the multicipital caudex densely clothed with the dead petioles and the silky-villous stipules: scapes several to numerous, canescently appressed-pubescent or at length glabrate, exceeding the leaves, 1–2 dm. high; leaves and petioles canescently sericeous, somewhat crowded on the crowns, $\frac{1}{2}$–$\frac{3}{4}$ as long

as the scapes; leaflets 7–13, oblong to linear-lanceolate, acute, the longest often 25–30 mm. long, some of the primary ones short (5 mm.) and obtuse; inflorescence crowded, 10–20 flowered, elongating in fruit: calyx and bracts softly silky-lanate: bracts conspicuous, greenish, leaf-like, lanceolate, equaling or but slightly shorter than the calyx: calyx inflated in fruit, globose-urceolate, 10–15 mm. long, its teeth short, greenish: corolla white or yellowish, nearly twice as long as the calyx, the standard with a few purplish streaks and the keel with a conspicuous spot near the tip: pod pubescent, inflated but with firm walls, oblong-elliptic, nearly filling the calyx, the style abruptly flexed near the summit and protruding from the narrowed mouth of the calyx.

Probably a rare plant; but two collections of it known to the writer. Secured by Mr. Elias Nelson on an exposed summit in the Seminole Mts., at about 10,000 ft. alt., July, 1898, No. 4925; and by Dr. J. W. Blankinship on "dry mountain benches" near Bozeman, Mont., July, 1898.

Aragallus Blankinshipii. Habit of the preceding, about the same size, scapes less stout, branches of the caudex short, clothed with brown bases of dead leaves: leaves loosely sericeous-silky, crowded on the crowns, rather lax, on weak petioles, only about half as long as the scapes: leaflets 11–17, approximate, linear-oblong, acute at both ends, 12–16 mm. long: inflorescence dense both in flower and in fruit, 8–12 flowered: calyx loosely lanate-hirsute, a little more than half as long as the corolla, the linear lobes more than half as long as the tube, inflated in fruit, becoming sub-globose: corolla purple, about 20 mm. long, the wings and standard rather deeply 2-lobed: bracts small, linear-lanceolate, shorter than the calyx tube: pod wholly inclosed in the calyx, small, 6–9 mm. long, narrowly elliptic, gradually acuminating into the style, which barely protrudes from the narrow orifice of the calyx, one-celled, slightly inflated but the walls firm.

This species is in many respects comparable to the preceding but the shorter, smaller and more crowded leaves, the smaller and more villous leaflets, the less conspicuous stipules, the small bracts and handsome purple flowers will at once distinguish it. Like the preceding, its calyx and fruit characters ally it to *A. multiceps*, though in habit they both would rather suggest *A. monticola*.

Collected by Dr. J. W. Blankinship, on dry, rocky hillsides along Middle Creek, 15 miles S. W. of Bozeman, Mont., June 4, 1898.

** Pod turgid, included in but filling the distended (often split) calyx.

ARAGALLUS LAGOPUS (Nutt.) Greene, Pitt. III, 212 (1897). *Oxytropis Lagopus* Nutt., Journ. Acad. Philad. VII, 17. Not at all frequent but sometimes abundant on low ridges on the plains. Seemingly confined to Wyoming and Montana. I think it should be noted that the number of pairs of leaflets is often 5–7. Specimens seen: R. S. Williams, No. 353, Great Falls, Mont., 1895; Mrs. M. L. Alderson, Gallatin Co., Mont.; Nos. 60 & 1294, Laramie, Wyo., 1894 & 1895, by the writer.

ARAGALLUS NANA (Nutt.) Greene, l. c. *Oxytropis nana* Nutt., T. & G. Fl. N. A. I., 340 (1838). The range of this is said to be the same as that of the preceding, but the actual specimens ever cited are very few, and, so far as I know, either from northwestern Wyoming or southern Montana. My only specimens are those of F. D. Kelsey, Deer Lodge, Mont., June 9, 1892. Though these are probably all right, yet since the specimens are in blossom only, one can not pronounce on them with certainty.

*** Calyx not inflated, distinctly surpassed by the mature pod.

+– Pod bladdery inflated; flowers few.

Aragallus inflatus (Hook.). *Oxytropis arctica inflata* Hook., Fl. Bor. Am. I, 146 (1833); *O. podocarpa* Gray, Proc. Am. Acad. I, 146 (1864); *Spiesia inflata* Britt. Mem. Torr. Club, V. 201 (1894); Britton & Brown, Flora, II, 307 (1897). Exceedingly rare or, because of its sub-alpine or alpine habitat, not often distributed from the Rocky Mountains.

Aragallus oreophilus (Gray). *Oxytropis oreophila* Gray, Proc. Am. Acad. XX, 3 (1884). Whether any specimens of this have been secured since those upon which the species was founded were distributed, I can not say. It certainly remains a rare plant.

+–+– Pod coriaceous, not inflated, flowers 1–3.

ARAGALLUS PARRYI (Gray) Greene, l. c. *Oxytropis Parryi* Gray, l. c. Like the two preceding this continues to be almost unknown. The only specimen at hand is one of Hall & Harbour's, No. 143. It is hoped that some one who has inclination for alpine collecting will look this up and secure enough to give us all some familiarity with it.

+++ Pod turgid but not membranous-inflated, more or less coriaceous, sub-terete; flowers several to many, capitate or spicate.

++ Somewhat glandular-viscid; pod half 2-celled.

ARAGALLUS VISCIDUS (Nutt.) Greene, l. c. *Oxytropis viscida* Nutt.; T. & G. l. c.; Gray, l. c. A rare plant but excellent specimens have been secured as follows: Wallace Creek, near Garfield Peak, July, 1894, 669; in the same locality, July, 1898, No. 5016; Gros Ventre River, Aug., 1894, No. 928. Specimens from Great Falls, Mont., by R. S. Williams, No. 619, though not typical must be referred here.

++++ Neither glandular nor viscid; pod nearly 2-celled.

Aragallus gracilis. Tufted, the branches of the caudex short; scapes few to several, erect, rather slender, stouter in fruit, lightly pubescent, somewhat striate, 2–5 dm. high (including the spike): leaves several from the crowns, mostly erect, shorter than the scapes (about half as long as the scape in fruit); leaflets numerous, 10–15 pairs, mostly oblong-lanceolate, from sparsely soft-pubescent to lightly canescent, 15–25 mm. long; inflorescence spicate, elongated and somewhat open in fruit; bracts rather conspicuous, often equaling or exceeding the calyx, silky, the hairs sometimes short and nigrescent; calyx short-cylindric, its tube scarcely twice as long as its linear lobes, pubescence similar to that of the bracts; corolla ochroleucus or more distinctly yellow, about 15 mm. long, and twice as long as the calyx; wings obliquely truncate or emarginate at apex; pod pubescent, oblong-ovate, about 20 mm. long, semi-membranous, soon splitting the calyx, nearly two-celled.

That this is a valid species I am convinced, but I was at first inclined to refer it to the *Oxytropis campestris spicata* Hook. of T. & G. Fl. N. A. I, 341. From doing so I am deterred by the statements that in that var. the flowers and leaflets are somewhat remote, and further by the fact that Dr. Gray, in his revision of *Oxytropis*, Proc. Am. Acad. XX, 6, says, "var. *spicata* seems rather to belong to *O. Lamberti*." *A. gracilis* is certainly more nearly allied to *A. campestris*.

This species is not to be confused with any other in the Rocky Mountains unless it be with *A. albiflorus*, from which its less tufted habit, its slender scapes, its smaller and more distinctly

yellowish flowers, its softer and mostly sparser pubescence and greenish aspect will readily distinguish it.

The following collections show this species to be of the moist ground in the open woods of the mountains or hills: Type specimens from Limestone Range in the Black Hills (Wyoming), No. 2545, July 30, 1896; Laramie Hills, July 22, 1897, No. 3428; Medicine Bow Mts., near La Plata Mines, No. 5072, Aug. 22, 1898 (the last two Nos. by Mr. Elias Nelson). A specimen by Dr. J. W. Blankinship, in mature fruit, from Mystic Lake, Mont., Aug. 1, 1898, may be this species, and specimens by Dr. W. A. Burman from Gladstone, Manitoba, July, 1897, distributed as *Oxytropis campestris*, must be similarly referred, as must, I think, Elmer's No. 595 from Loomiston, Aug., 1897, distributed as *O. Lamberti*.

Aragallus dispar. Taproot strongly characteristic, rather slender, gradually attenuated downward, 1–3 dm. long; caudex very short, its branches few, crowded, densely clothed with the membranous stipules which are covered with long, white, strigose hair; scapes few to several, moderately stout, distinctly tapering upward, lightly silky-pubescent, somewhat unequal in length, 1–2 dm. high, nearly twice as long as the leaves; leaves silky-pubescent, crowded, erect, unequal, the primary short; leaflets 5–9 pairs; those of the primary leaves small, from orbicular to oblong, often only 5 mm. or less in length; those of the longer leaves oblong to linear, 7–12 mm. long; spikes short, dense, many flowered; bracts from much shorter to nearly equaling the calyx; calyx half as long as the corolla, silky-lanate, with minute, dark pubescence underneath, short-tubular, its lobes merely short teeth, not more than one-fourth as long as the tube; corolla purple or ochroleucous with a purple spot on the keel, 15–18 mm. long; pod oblong, tapering into a short, thick point, pubescent, scarcely twice as long as the calyx.

A strongly marked species; its slender, vertical taproot, tapering scapes, two forms of leaves and leaflets and very short calyx lobes are quite characteristic. The two colors of the flowers appear in specimens from the same locality. Type specimen from Mrs. C. R. Cook, Dickinson, N. D., June, 1896. Also collected by Dr. J. W. Blankinship, Custer, Mont., June 7, 1890.

++++++ Neither glandular nor viscid; pod only half 2-celled or less.

Aragallus monticolus (Gray) Greene, l. c. *Oxytropis monticola* Gray, l. c. Young plants of this species are not always readily separated from immature specimens of *A. lagopus*, but in fruit they are distinct enough. In general the latter is a smaller, more tufted and spreading plant, and more loosely silky-villous. It is of the plains, while *A. monticolus* occurs in the mountains and foot-hills. Specimens seem to bear out the statement, that the flowers are either violet-purple or ochroleucus. Specimens examined: Nos. 4321, Laramie Hills, May 21, 1898, and 4924 Seminole Mountains, July 21, 1898 (both by Elias Nelson); Custer Mont., June 7, 1890, No. 152, by J. W. Blankinship.

Aragallus Lamberti (Pursh) Greene, l. c. *Oxytropis Lamberti* Pursh, Sims, Bot. Mag. t. 2148. To this well-known species it seems probable that too wide a range has been ascribed, owing to the inclusion under this name of some other species. Northern Kansas, Nebraska, Minnesota, the Dakotas, Montana, and eastern Wyoming and Colorado will, I think, be found to furnish most of the authentic specimens of this species. The original descriptions very properly excluded all but the purple or violet flowered forms, for it will be found that those of other colors have recognizable specific characters in the field if not in the herbarium (see notes to *A. albiflorus* below). What I take to be typical *A. Lamberti* is represented by my Nos. as follows: 1320, Laramie Hills, near Table Mountain, July 1, 1895; 3247, Green Top, June 29, and 3322, Little Laramie River, July 4, 1897.

Aragallus Lamberti **sericea** (Nutt.). *A. sericea* (Nutt.) Greene, l. c. *Oxytropis Lamberti sericea* Gray, l. c. Eastern Wyoming and the whole eastern base of the Rocky Mountains is the range ascribed to this plant. In several specimens before me, by various collectors, I am unable to detect characters that will satisfactorily separate it from the foregoing. Its slightly broader leaflets which are inclined to differ on the primary and the later leaves, the greater silkiness (and this varies greatly) and the somewhat more robust spike are the differences to which attention is drawn.

Aragallus albiflorus. *Oxytropis Lamberti ochroleuca* Aven Nelson, First Rep. Fl. Wyo. 98. Root large and deep-set: multicipital caudex a rounded tuft of short, close-set branches which are

clothed with the scale-like bases of the dead stipules: stipules covered with coarse, white, straight hairs: scapes 2–4 dm. high (including the spike), numerous, rather stout, at first scarcely exceeding the leaves, elongating in fruit, thinly pubescent: leaves very much crowded on the crowns, the longer reaching the base of the spike; grayish with a short, appressed pubescence, leaflets 6–10 pairs, oblong to lanceolate, sub-acute, 15–25 mm. long: bracts lanceolate, shorter than the calyx-tube: calyx sericeous with some short, black hairs intermingled, its linear teeth greenish and about half as long as the tube: corolla white with a yellowish tinge which deepens as the flowers dry, a purple spot on the keel, 20–25 mm. long; wings broadly dilated (the blade almost as broad as it is long), somewhat obliquely two-lobed by a broad, triangular notch: pod pubescent, oblong, with a straight tip, at maturity about twice as long as the calyx, ventral suture somewhat intruded.

At the time that I proposed this as a variety of *A. Lamberti*, l. c., I was satisfied that it was very different from that species. Further field work and a large series of specimens make it certain that these differences are specific. Much difficulty has arisen as to *A. Lamberti* because of the attempts to hold these plants together. I know well enough that color of flowers alone is not distinctive, but of a large series of specimens of what I conceive to be typical *A. Lamberti* all have purple or purplish flowers, while the species now proposed is always, as to color, as given above.

The two species are readily separated by the densely tufted habit of *A. albiflorus*, its shorter, thicker spike, its hairy stipules and its crowded leaves and scapes (rarely and only in young plants do we find the tufts small or nearly simple).

Besides repeated collections of this in the vicinity of Laramie, I would refer here specimens by J. W. Blankinship, No. 146, Custer, Mont.; E. V. Wilcox, Big Belt Mts., July 25, 1898; Mrs. M. L. Alderson, Gallatin Co., Mont.; C. S. Crandall, mountains, Larimer Co., Colo., June 24, 1896; Geo. E. Vasey, Colo., 1889: Possibly also by Alice D. Pratt, Piedmont, S. D., June, 1895 (distributed as *Spiesia Lamberti spicata* Hook.); and A. A. Heller, No. 3751, New Mexico, distributed (but I think not published) as *Spiesia albiflora* Heller, n. sp.

ARAGALLUS ALBIFLORUS **condensatus.** Similar to the species

but smaller and more compact: leaves elliptic to oblong, obtuse or sub-acute, mostly, 5–7 pairs: scapes but little exceeding the leaves even in fruit, mostly less than 1 dm. high; purple spot on the keel conspicuous: pod twice as long as the calyx, broadly oblong or nearly elliptic with a short, straight, sharp point.

This is the most compact plant of this genus that I have seen. Collected but once, on a naked, red, gravelly hilltop which was abundantly dotted with the sub-spherical clumps (single plants): Point of Rocks, June 16, 1898, No. 4773.

Aragallus involutus. Root habit of the preceding, the caudex with short branches which are clothed with the more or less membranous, nearly glabrous leaf-bases; scapes and leaves greenish, very thinly strigose pubescent; leaves numerous from the crowns, on slender petioles; leaflets 13–19, linear, with more or less involute margins, 2–4 cm. long; scapes slender, curved-ascending or nearly erect, 2–5 dm. high (including the long spike), from only a little exceeding the leaves to nearly twice as long; spike at length slender and rather open; calyx canescently tomentose, about 1 cm. long, longer than the linear-lanceolate bracts; corolla purple; the blade of the standard broadly oval; the wings narrowly ovate, entire at the apex, its slender claw shorter than the blade; tip of the keel comparatively long and slender; mature fruit not at hand.

Through the courtesy of Prof. Conway McMillan I have been able to see a number of specimens of this excellent species. It was collected at Acton, Meeker Co., Minn., June 1892, by Mr. W. D. Frost, and has been distributed as Spiesia Lamberti (Ph.) O. K.

3. Stipules adnate to the petiole; leaflets numerous, sub-verticillate in threes or fours; pod 2-celled.

ARAGALLUS SPLENDENS (Dougl.) Greene, l. c. *Oxytropis splendens* Dougl. in Hook. Fl. Bor. Am. I, 147 (1834). This truly splendid species occurs in many mountain valleys; it is so distinct that it can not well be confused with any of the other species. Though always well represented in herbaria yet the following may be cited as typical: No. 4372, Willow Creek, July 1, 1898.

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NEW SPECIES IN OREOCARYA AND ITS ALLIES.

By Aven Nelson.

Among the characteristic plants of the high plains, the arid foothills and the more desert areas, such as the Red Desert of Wyoming, one of the conspicuous groups is the one we only recently knew as *Krynitzkia*. During several years of rather extensive collecting, especial effort has been made to fully represent the species in this group, and, as a result, not only are the species accredited to this range fairly well illustrated but a considerable collection representing most of the species of the western United States has, through the kindness of other collectors, been secured.

In the mass of material that has been piling up as possible novelties there are several forms now so fully represented and so evidently different from any heretofore published as to warrant proposing them as new. Some others are at hand, but further observations in the field, and specimens in other stages of development, are needed before they may be passed upon.

In many respects it is an uninviting group, one into which one enters with much trepidation at best, though with less if familiar with the forms under consideration in the field. It seems to me that some of the difficulties, too, have been removed by the arrangement of the species under three more closely-delimited genera.

Oreocarya cæspitosa.* The multicipital caudex densely tufted, its branches short and thickly clothed with dead leaves; stems short, only 5–10 cm. high, numerous, singly from the crowns, simple; leaves crowded on the crowns and several on the stems, linear to spatulate, obtuse or sub-acute, 5–30 mm. long including the slender petiole-like base, densely silky canescent; inflorescence at first capitate, at length more open, thyrsoid-glomerate or short spicate, the dense pubescence fulvous or canescent (scarcely hispid); lower bracts leaf-like, the upper small and not surpassing the calyx;

*Of most of the species in this paper, material in abundance is at hand and typical specimens will shortly be found in the leading herbaria of this country, affording opportunity for their study.

sepals linear, 4–5 mm. long; corolla white, its tube scarcely equaling the sepals and about equaled by its sub-orbicular lobes, crests conspicuous; nutlets narrowly ovate, scarcely roughened on the back, attached nearly their whole length to the subulate gynobase.

Not very closely allied to any of the known species. I was at first inclined to associate it with *O. fulvocanescens* (Gray) Greene or *O. humilis* (Gray) Greene, but its cæspitose habit, its softer pubescence and short corolla tube preclude such comparison.

It is common on arid, naked hills throughout southern Wyoming,† often forming solid mats several dm. across. The following collections fully represent it: 3072, Green River, June 1, 1897; 3120, Red Desert, June 3, 1897; 4338, Cooper Creek, June 6, 1898; 4749, Point of Rocks, June 15, 1898; 4497, Medicine Bow, July 9, 1898. Other numbers are 4671, 4772, and 2876, the latter from Pine Bluffs, May 1897, more strictly canescent, inflorescence more capitate and anthers nearly oval instead of oblong.

Oreocarya flavoculata. Rather loosely tufted, the branches of the caudex few to many, very short, clothed with dead leaf bases: stems singly from the crowns (some of the crowns only leaf bearing), 1–2 dm. high, with a loose, spreading, hispid-ciliate pubescence: leaves crowded on the crowns and the stems somewhat equably leafy to the top, linear-spatulate or narrowly obovate, tapering into a slender petiole with expanded base, the cauline becoming linear-oblong and sessile, finely canescent with some longer, strigose, spreading hairs: inflorescence at first crowded but at length a thyrsus of short, axillary racemes, the pubescence fulvous and somewhat strigose: sepals narrowly lanceolate, about 7 mm. long: corolla white or yellowish, the throat and conspicuous oblong crests a bright, clear yellow, tube slightly exceeding the calyx and nearly twice the length of the oval lobes: nutlets short, ovate, distinctly roughened-papillate on the back.

This species has some characters in common with the preceding and with *O. flava* Aven Nelson but is very distinct from them both. Its long fornicate crests, yellow-eyed flowers and tufted habit make it easily distinguishable. Collections of it as follows are at hand: 4572, Piedmont, June 7 (taken as the type); 4616, Carter, June

† All localities given in this paper are in Wyoming unless otherwise stated.

10; 4815, Fort Steele, June 18; and 4337, Cooper Creek, June 6, 1898,—the latter by Mr. Elias Nelson.

OREOCARYA FLAVOCULATA **spatulata.** The multicipital caudex and deep-seated root covered with loose shreds of the brown bark, much of their tissues dead and easily crushed or torn into strips (in these respects like the species): branches of the caudex naked except on the 1–few crowns which are swollen with the crowded leaf-bases: pubescence similar but less dense than in the species: stems spreading or ascending: leaves spatulate, obtuse: beginning to flower when very young, inflorescence at first congested but later, as in the species, leafy bracted: corolla white, slightly yellow in the throat, crests emarginate: essential organs dimorphic; stamens in the throat or ¼ below; style equaling the exserted crests or only about half as long as the tube.

Two collections of this are at hand, both from gravelly hilltops near Evanston, No. 2977, May 29, 1897 and 4513, June 4, 1898. Possibly a fuller knowledge of it will show it to be distinct. It is at once to be distinguished from the species by its spreading-assurgent habit, its broader, spatulate leaves, shorter stems, thinner pubescence and white flowers.

OREOCARYA AFFINIS **perennis.**—Perennial, size of the species, stems several, singly from the crowns of the branched ligneous caudex, nearly equal, floriferous ½ their length or more; thyrsus very narrow, more open than in the species (the cluster distinctly axillary): nutlets nearly smooth, obscurely wing-margined.

Further material of this with fully mature nutlets may show it to be a distinct species. If the wing-margined nutlets prove constant it will have to be separated from *O. affinis* (perfectly characterized in Pitt. III., 110) in spite of its great similarity in floral characters, pubescence and habit. Secured at Green River, May 31, 1897, No. 3035, and again at the same place in 1898, June 14, No. 4715.

Oreocarya longiflora. Biennial, or probably a short-lived perennial, 1 or more stems from the mostly simple crowns, 1–2 dm. high: leaves mostly on the crowns, crowded, obtuse, spatulate, on broadish petioles, whole length 3–7 cm., cinereous with a close canescence and an open, strigose pubescence: inflorescence thyrsoid, occupying the whole length of the stems, its numerous racemes in

the axils of the leaf-like bracts (only the upper bracts small and inconspicuous), the whole densely yellowish setose-hairy: sepals linear, erect, closely approximate so that the calyx appears tubular, 8–10 mm. long, longer in fruit: corolla tube slender, exceeding the calyx by $\frac{1}{3}$–$\frac{1}{2}$, its lobes only $\frac{1}{4}$–$\frac{1}{5}$ as long as the tube: stamens dimorphic, anthers linear, about 3 mm. long, nutlets ovate, obtuse, 3–4 mm. long, acute angled, slightly keeled on the back, somewhat obscurely transversely rugose and low papillate towards the margins.

A very strongly marked species with somewhat the habit of *O. thyrsiflora* Greene but never to be confused with that or any of the related species on account of its long, tubular calyx, its long corolla tube and short lobes, and its characteristic pubescence. Perhaps it will help to locate it to say that it is somewhat intermediate between *O. fulvocanescens* (Gray) Greene and *O. humilis* (Gray) Greene, from both of which it differs both in foliage, pubescence and inflorescence. Collected by Prof. C. S. Crandall, at Palisades, Mesa Co., Colo., May 14, 1898, and distributed as *Eritrichium fulvocanescens* Gray. Type in Herb. University of Wyoming.

Cryptanthe ramulosissima. Densely and intricately branched from the base upward, the whole forming a sub-spherical mass 2–4 dm. in diameter, in autumn probably becoming a "tumble-weed" by the snapping of the slender tap-root, densely hispid throughout: leaves small, very numerous, linear, green, the sparse hairs with pustulate bases: spikes very numerous, densely flowered, uniserial, but the flowers arranged in pairs: sepals setose-hispid, linear with midrib slightly thickened at base, 5–6 mm. long, the tips open or spreading; nutlets smooth, sub-conical, somewhat acuminate, 2 mm. long, the narrow ventral groove widening slightly toward the base and terminating in an open areola, usually all four maturing.

This species is most nearly related to *C. Fendleri* (Gray) Greene, but its remarkably branched habit will at once separate it from that and more distinctively yet from *C. Pattersoni* (Gray) Greene. It is separated also by the less thickened sepals, the slender branchlets, and somewhat paired flowers.

It was found in considerable abundance at Laramie, the type being No. 5275, Sept. 6, 1898.

CRYPTANTHE MURICULATA **montana.** Resembling the species but smaller, erect, with few and rather strict branches, the inflorescence sparse when fully evolute; fruiting calyx 5–6 mm. long, tips of sepals spreading or merely open, the midrib narrow but distinct: nutlets very closely and minutely muriculate, the tooth-like points (as seen under the microscope) curved ascending.

This is clearly related to *C. muriculata* (Gray) Greene, but whether its characters are such that it may be considered distinct further collections only can settle. *C. muriculata* is of the far west and southwest while this is of the interior. Its smaller size, closely and finely muriculate nutlets, which have more rounded sides, will serve to distinguish it. The specimens before me are from Granger, June 13, 1898, where they were growing on a rocky ridge in the protection of the undershrubs. Specimens by Mr. M. E. Jones, from Silver Reef, Utah, May 4, 1894, distributed as *Krynitzkia Watsoni* Gray are probably the same.

Allocarya Hendersoni. Simple at the base but sparsely branched above, erect, 2–4 dm. high, slender, sparsely and rather softly strigose-pubescent throughout: leaves broadly linear, 4–6 cm. long, 3–6 mm. broad, acutish: spikes naked, at length long and slender, the uppermost geminate with a floret in the fork: fruiting calyx short pediceled, its sepals linear and moderately strigose-hispid, about 5 mm. long: corolla 5–6 mm. in diameter, the throat nearly closed by the comparatively large emarginate crests: nutlets ovate, sub-acute, 2–3 mm. long, very closely and finely muriculate, with a few small, rounded papillæ interspersed, moderately carinate on the ventral side only.

This excellent species I have only seen from western Idaho and eastern Washington, represented by the following specimens: L. F. Henderson, Potlatch River, Idaho, May 31, 1895, distributed as *Krynitzkia muriculata* Gray; A. D. E. Elmer, Pullman, Wash. June, 1896, distributed as *Krynitzkia Torreyana* Gray; A. A. & E. Gertrude Heller, Lewiston, Idaho, April 30, 1896, distributed as *Allocarya Scouleri* (H. & A.) Greene.

That this is an *Allocarya*, I think, can scarcely be questioned, but it must be admitted, that in habit it greatly resembles the *Cryptanthes*. Its nearest ally is probably *A. Scouleri*, but from that

species its less branched habit, its shorter and relatively broader leaves, its smaller and fewer flowers and very different akene easily distinguish it.

University of Wyoming, Laramie, Wyo.

ISLAND FLORA NOTES.

By T. S. Brandegee.

Hemizonia Clementina. *H. Streetsii* Gray, Syn. Fl. Suppl., p. 451, not of Proc. Am. Acad. XII, 162. Hirsute, especially below; stems erect or ascending, at length much branched and leafy to the numerous corymbosely-crowded heads, 3–4 dm. high: leaves linear, obtuse or acute, attenuate to the base, 4–8 cm. long, entire or with a few short teeth: heads 8–10 mm. high; involucral bracts linear, those of the receptacle about 15, slightly united below; rays 14–20, 5 mm. long; disk flowers numerous: akenes of the ray rugose-tuberculate at maturity, indistinctly triangular, with an upturned beak, and stipe 1 mm. long, those of the disk sterile, bearing a pappus of about 10 subulate-linear paleæ, unequal in length and width.

This species grows upon San Clemente and Santa Catalina Islands, It was referred by Dr. Gray to *H. Streetsii* of San Benito Islands. who considered the smaller plants from these islands "dwarf and early specimens." The living plants of these two species are strikingly different, and at first sight of those on San Benito, I was certain they could not be the same as those from the more northern islands.

H. Clementina on San Clemente Island seemed to me to be a semi-shrubby perennial, with many stems from the root; while *H. Streetsii* is an annual six to ten inches high, with a single stem, although I have seen one or two plants having an indurated root and prostrate spreading habit, that might have been more than a year old. *H. Streetsii* has simple stems branched above, the heads not so crowded, rays longer and more conspicuous, leaves shorter and more obtuse, more coarsely toothed, and with an auriculate clasping base.

On Todos Santos Islands, a shrubby Hemizonia is very common. It seems to be the same as specimens named *H. frutescens Gray*,

collected by Dr. Palmer on Guadalupe Island, although neither of them exactly agrees with Dr. Gray's description of that species.

CORRECTION.—On page 3 preceding, last line, for *monticolum*, inadvertently printed, read *monticola*.

SHORT ARTICLES.

NOTES ON COLORADO PLANTS.—During several seasons of botanizing in northern Colorado I have collected several plants which seem to be of some interest as occurring in the state, and I note them to add to their geographical range. Of these may be noted:—

1. Plants of the Plains. Some of these may have come to Colorado from the east. *Acuan Illinoensis* (Mich.) Kuntze and *Lacinaria spicata* (L.), Kuntze, are found at Sterling in Logan County, *Euphorbia serpens* H. B. K., and *Tissa marina* (L.) Britton, at New Windsor in Weld County, and *Heteranthera limosa* (Sw.) Willd, on the eastern border of Larimer County.

2. Plants of the Foot-hills. These are found at an altitude of 5,000 to 7,000 feet, and are indigenous. *Smilax herbacea* L., and *Osmorrhiza longistylis* D. C., grow along streams on the eastern side of the mountains in Larimer County, *Helianthemum majus* B. S. P., at Palmer Lake, on the divide between Denver and Colorado Springs, and *Solidago speciosa* Nutt., in the mountains of Larimer County, at about 7,000 feet altitude. This I have collected only once. Here, too, may be placed *Astragalus artipes* A. Gray, collected at Glenwood Springs, on the western slope. So far as I know it has been reported only from Arizona and Utah.

3. Plants of the Mountains. Some of these are northern species which come to Colorado along the high mountain-range. *Mimulus Lewisii* Pursh is found in the high mountains west of North Park. About North Park are also found *Ranunculus tenellus* Nutt. (R. Bongardii Greene), and *Angelica pinnata* Watson. *Astragalus Purshii* Dougl. grows on some of the hills, and *Astragalus debilis*, (Nutt.) A. Gray, along the North Platte. In the synopsis of the genus by Dr. Sereno Watson, in the "Botany of King's Expedition," the location of this is given as "Plains of the Rocky Mts. along streams (Nuttall)." *Ranunculus acriformis* A. Gray, which seems

to be a plant of very limited range, noted only about the Laramie Plains of Wyoming, is quite plentiful along some of the streams of North Park, and *Chrysothamnus Vaseyi* (Gray) Greene is abundant on the dry ground. *Pentstemon strictus* Benth., is also found here and at Glenwood Springs. In Estes Park in the vicinity of Long's Peak are found *Menyanthes trifoliata*, L., and *Naumburgia thyrsiflora*, (L.) Duby, and on the margin of a subalpine lake *Carex Magellanica* Lam. On the mountain-sides in the same vicinity grows *Cypripedium fasciculatum* Kellogg. I first collected this rare and beautiful orchid here in June, 1894, and have since found it in the mountains of southern Wyoming. It probably ranges for some distance along the mountains at an altitude of 8,000 to 10,000 feet. It has been known only from the mountains of Northern California and Oregon, but possibly intervening stations may yet be found.—Geo. E. Osterhout.

New Windsor, Colorado.

NEWS NOTES AND CURRENT COMMENT.

Two West American plants were figured in the February number of the *Botanical Magazine*, namely, Ceanothus integerrimus, plate 7640, and Epilobium obcordatum, plate 7641.

The will of the late Prof. O. C. Marsh, of New Haven, bequeaths his entire estate, valued at $150,000 to $200,000, to Yale University, with the exception of $10,000 for the National Academy of Sciences. The handsome home of the eminent Yale paleontologist, with its fine grounds and greenhouses, including a famous collection of orchids, is given to the University for a botanic garden. The house itself may be used either as a residence for the director of the garden or as a botanical laboratory, as the Yale Corporation may decide.

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THREE UNDESCRIBED CALIFORNIAN ALGÆ.

By W. G. Farlow.

Dictyopteris zonarioides Farlow. *Haliseris polypodioides* McClatchie Proc. Southern California Academy, I, 354. Exs. Phycotheca Boreali-Americana No. 581.

Fronds dingy brown or blackish arising from a stupose base, densely and irregularly dichotomous, divisions without lateral veins, midrib tomentose, percurrent, laminæ soon disappearing below, much incised and lacerate above, ultimate dichotomies short, broader than the lower ones, often subflabellate, tips short, obtuse, or slightly retuse, rather divergent. Tetrasporangia (gonidangia) numerous in sori parallel to the midrib on both sides of the froud, 75–100 μ in diameter.

Santa Barbara, Dr. Dimmick, Mrs. Cooper; San Pedro, common on rocks just below low water mark, Setchell, McClatchie; San Diego, Cleveland, Mrs. Snyder, Farlow.

This perplexing species has been known since 1875, when it was first found by Dr. Dimmick at Santa Barbara. Specimens have been seen by me collected from November to June, and, as those of the latter month appeared to be young, it is probable that the species is to be found throughout the year. The earlier known specimens not being in good condition, their denuded bases and flabellate extremities caused them to be regarded as old and attenuated forms of what is generally known under the name of *Zonaria Tournefortii* on the Californian coast. On the other hand, young specimens found later passed with collectors for the young of some species of Fucus to the evesiculate forms of which they bear a certain resemblance. When in good condition, however, the percurrent midrib and the special growth by means of a small number of initial cells show conclusively that the alga is a Dictyopteris. Cross sections show the two internal layers of colorless cells, 11–15 μ in diam. with a single layer of colored cortical cells found in the laminæ of other species of the genus as well as the scattered tufts of hairs found in most phæosporic algæ. The description given above applies to the fully-developed plant which is usually between three

and five inches long, and does not often attain a length of more than eight inches.

Our species may be distinguished from *D. polypodioides* by its dark color, its denser substance, and by the fact that the dichotomies are more closely arranged and that instead of having long, slender, and more or less tapering ultimate divisions, they are short, blunt, and broader than the frond below. In color and substance *D. zonarioides* approaches more nearly the Japanese alga collected by C. Wright during the north Pacific expedition under Ringgold and Rodgers to which Harvey gave the name of *Haliseris polypodioides* var. *crispatula*, although the name does not appear in his account of the algæ of that expedition, *Proc. Am. Acad., Arts & Sci.* IV, 327, 1859. This form has recently been described by Holmes under the name of *Dictyopteris undulata*, Jour. Linn. Soc. XXXI, 251, Pl. 8, fig. 1, 1896. This plate gives a correct representation of the habit of Harvey's var. *crispatula*, of which I have seen all the specimens collected by Wright. They were all remarkably alike and showed no variation of habit and, at first sight, their very regular crisped laminæ do not suggest at all our Californian alga. In a few rather poor specimens of the latter, the laminæ are somewhat crisped, but in by far the majority of cases one is struck by the constantly incised fronds with few if any undulations. It might be supposed that the incisions in one plant were in fact ruptures of the folds of a crisped, in which case younger specimens should show the folds. But, on the contrary, the younger and fresher specimens are not crisped at all. Certainly neither Wright specimens nor the figure quoted represents the typical form of *D. zonarioides*, and, unless a farther study of the Japanese species shows that it varies towards the typical form of our own species, the two must be kept distinct.

Spermothamnion Snyderæ Farlow. Exs. Phycotheca Boreali-Americana, No. 598.

Fronds cæspitose, filamentous, monosiphonous, primary filaments, procumbent rooting, branches vertical, monopodial bearing below a few long simple ramuli and above more numerous, shorter secund ramuli which are 2–3 times secundly cymose. Tetrasporangia terminal on the ultimate secund ramuli, at first tripartite, becoming

later polysporous (24 spores). Cystocarps naked on short unicellular lateral ramuli, often bi-lobed.

Santa Cruz, Mrs. Snyder; Santa Barbara, Mrs. Bingham; San Diego, Mr. Cleveland, Mrs. Snyder.

This species, which forms dense tufts one to two inches high, of a purple-lake color, on rocks at low tide, resembles, when mounted, specimens of *Rhodochorton floridulum*. It belongs to the subgenus Meristocarpus of Naegeli's Herpothamnion, which is now considered not to differ from the Spermothamnion of Areschoug. Cystocarpic material collected by Mrs. Snyder, for which I am indebted to Mr. Collins, show, that our plant, both in the young stages and mature fruit, corresponds perfectly with other species of Spermothamnion. The species is distinguished from its allies by its naked cystocarps, which appear to be borne on short unicellular pedicels scattered along the large branches as well as by the large number of polyspores which exceed the number (16) found by Naegeli in *S. intricatum*. Furthermore the descriptions of *S. intricatum* and *S. sphæricum*, the two species placed by Naegeli in his subgenus Meristocarpus characterized by the presence of polyspores, show that their habit is unlike that of *S. Snyderæ*, which, as has been said, has a strong external resemblance to *Rhodochorton floridulum*. I saw no antheridia on the conceptacular plants examined, and it may be that the species is dicœcious.

Polyopes Bushiæ Farlow. Exs. Phycotheca Boreali-Americana, No. 600, sub. *Cryptonemia*.

Stipe short, cylindrical, cartilaginous, passing into a narrow, flat or slightly channeled, linear frond which is repeatedly dichotomous flabellate in outline with obtuse, erect or slightly diverging tips. Cystocarps in groups immersed in the tips of short lateral pinnæ on the larger dichotomies.

San Pedro, Mrs. Bush; San Diego, Mr. Cleveland, Mrs. Snyder, Farlow.

A rather pretty, deep rose-red species, which is apparently not common and is only known washed ashore. It is nearly always sterile, and I have seen but a single specimen collected by Mr. Averill, without note as to locality, which bears cystocarps, and they are scanty. The tetraspores are quite unknown, and, unfortunately,

without them in this one can not be quite sure of the genus to which the species belongs. A section of the fronds, which are about 3mm. broad, shows a central axis of longitudinal hyaline filaments surrounded by a zone composed of two or three layers of comparatively large sphæroidal cells with a cortex of much smaller, very regular, densely packed, and highly-colored cells, which appear nearly square in sections and are arranged in anticlinic rows. The cystocarps I have seen were quite mature, and I found none of their earlier stages. They arise in the subcortical layer, or rather on the external portion of the axillary layer, and are formed of a single nuclear mass of spores, with an ill-developed pericarp which apparently is formed of filaments which arise from cells at the base of the spore-mass. There is a well-marked carpostome. The general structure is that of Cryptonemia as that genus was formerly defined. Our plant appears to be nearly related to *Cryptonemia rigida* of Harvey's Ceylon Algæ and to Phyllophora Maillardi Mont. & Millardet and should be included with them in the genus Polyopes as limited by Agardh in Till Algernes Systematik, Part IV, 16 et seq. A knowledge of the tetraspores might perhaps lead one to a different view as to the genus, but in our ignorance of the tetraspores and of the early stages of the cystocarps the position of the present species can be only provisional. In its habit our plant is narrower and thinner than authentic specimens of *P. rigida*. It resembles the plate of *P. Maillardi* in the Notes sur l' Ile de la Reunion, in several respects, but that species is not so plainly dichotomous as ours, and, if one can judge by one of the figures, there is a midrib, which is, however, not at all prominent.

Harvard University.

SHORT ARTICLES.

New Localities for Rare Californian Plants.—*Sparganium Greenii*, Morong, is abundant at Lake Merced, San Francisco. It has heretofore been known only from Olema, Marin County, where Professor Greene originally collected the species.

Phlox adsurgens, Torrey. Mrs. W. J. Stringer recently collected this species in Seiad Valley, Siskiyou County. While common in Oregon it has not previously been reported from California.

Hesperochiron pumilus, T. C. Porter. A few plants were found near Summit Station, C. P. R. R., in the bed of a small rivulet down which water runs when the snow is melting. Though searched for assiduously in the surrounding country no more specimens were discovered.

Pyrola minor, L. Mr. J. W. Congdon found this in the region around Mono Lake, during the past summer. This is the second locality reported from California. Cf. Eryth. VI. 93.—Alice Eastwood.

Notice of Naudin.—The death, on March 19, 1899, of Mons. Chas. Naudin removes another of the few disinterested characters whose career is marked by untiring efforts to discover and cultivate new plants of utilitarian interest, and to distribute them as widely as possible over the earth.

We first hear of him as associated with Brongniart and Decaisne at the Jardin des Plantes, Paris. He there made a study of the Cucurbitaceæ in which family of plants he remained interested up to the time of his death; I received a letter from him written as recently as December 22 last, asking for seeds of wild Gourds from Western North America. He is said to have cultivated and experimented upon some twelve hundred cucurbitaceous plants. As a result of these experiments he was able to state that while the races or varieties of the same species of Cucurbita will cross with extreme facility, Cucurbita maxima, L., C. Pepo, L., and C. moschata, Duch., will not hybridize.

Naudin also monographed the family Melastomaceæ. He was selected as Director of the Villa Thuret (the private Botanic Garden established by Thuret and Bornet) when it became a Government Botanic Garden and Experiment Station, and he held the position till his death.

But Naudin was probably best known for his interest in Economic Botany and plant acclimatization; his "Manuel de L'Acclimateur," based on the "Select Extra-tropical Plants" of his friend von Mueller, is an invaluable aid to the student of agricultural and commercial botany. His last donation to California was a collection of seeds, including the "Courge Patate" of the French, of which he writes, "elle est très grimpante et courante, suivant les

circonstances. Les fruits sont petits mais très nombreux; excellents, accommodés de diverses manières." He also included seeds of Schinus terebinthifolius "bel arbre du Brésil," Zornia diphylla "du Brésil, légumineuse fourragère," and Pittosporum tenuifolium of New Zealand.

It is to Mons. Naudin that we owe the description and distribution of Iris pabularia, the "Krishum" of the inhabitants of Cashmir, who consider it a good forage-plant.

His interesting and valuable letters will be much missed by his many correspondents.—J. Burtt Davy.

NEWS NOTES AND CURRENT COMMENT.

The Yale Corporation, at a recent meeting, voted that the chair of botany held by the late Prof. Daniel C. Eaton until his death, should, hereafter, be known as the Eaton Professorship of Botany. It may be recalled that this professorship was founded and endowed by a relative and by friends of Prof. Eaton in the year 1864, although it has never been distinguished by a name. The extensive and valuable botanical library and herbarium which Eaton accumulated have been donated to the University by his family, and Mrs. Eaton has placed in the botanical laboratories a bronze tablet to her husband's memory, and, in addition, has founded a graduate scholarship in botany.

The disaffected, who complain of the monotonous character of the papers in the *Bulletin of the Torrey Club*, should forthwith consult the cover of the January issue of that publication, and observe that the title of the paper of Prof. Aven Nelson, of the Rocky Mountain Region, lends a peculiar diversity to the table of contents. It is a serious hope that Prof. Nelson's products are, unlike the prevailing cut-up, or, as we would now say, tailored species, of sufficiently ample dimensions to be of some service. Doubtless the rigid finger of blame is to be leveled at the printer; but neither the printer nor his gentle art can be held responsible for a title, equally startling, in the December *Botanical Gazette*, which reads, "The early botanical views of Prunus domestica, by F. A. Waugh. Mr. Waugh should

now entertain us with the more recent views held by Prunus domestica, or, if modesty check him, perhaps Prunus domestica will advantage us with some of its non-botanical views.

A BOTANICAL PARTY from the University of California is spending the summer in the Aleutian Islands, and expects to explore very thoroughly the island of Unalaska, although the Pribiloffs may be visited by one member of the party. The expedition left San Francisco, June 5, and consists of Prof. W. A. Setchell, who will give his attention almost exclusively to the seaweeds; Dr. W. L. Jepson, who will study the seed-plants; Mr. L. E. Hunt, who will do the camera work for the party and also collect lichens; and Mr. A. A. Lawson, who will devote much of his time to the collection of fungi. They expect to return to California about September 1.

ON February 26 last a scientific party, consisting of A. W. Anthony, well known to West American botanists, H. B. Kaeding, R. C. McGregor, R. H. Beck, Arthur Whitlock, Jas. N. Gaylord, George Spencer, Chase Littlejohn and Charles Jones, sailed from San Francisco in the steam-schooner *Stella Erland*, bound for the South American Coast and the Galapagos Islands. During a fog on the night of March 18, the boat ran ashore in a heavy current on the coast thirty miles north of Magdalena Bay, Baja California. All the party were saved, but the vessel, which belonged to Mr. Anthony, was a total loss. This is Mr. Anthony's second experience in a sea disaster, he having been wrecked on the same coast something over a year ago.

WE LEARN from its annual report for 1897–8, that the Field Columbian Museum has acquired by purchase the complete herbarium of the late Mr. M. S. Bebb, of Rockford, Illinois, who was for so many years our most capable student of the North American willows.

A "GENERA SIPHONOGARUM," by Dr. Torre and Dr. Harms, based upon the Engler system, is in advanced preparation and will soon be published. It will be to Engler and Prantl's Die Natuerlichen-pflanzenfamilien, what Durand's Index is to Bentham and Hooker's Genera Plantarum, and will be of similar service in the herbarium and library. The ready consultation of Engler and

Prantl, as everyone is aware, is impossible. May Doctors Torre and Harms prosper in their undertaking.

Bulletin No. 40 of the Wyoming Experiment-Station, "The Trees of Wyoming and How to Know Them," by Prof. Aven Nelson, should be useful. It is very fully illustrated, and by means of it the novice may learn the names of the native trees and the more important facts concerning them. The Bulletin also has for its object the development of a popular interest in the forests and in the forest-reservations of the state, of which there are three, exclusive of the Yellowstone Park. Concerning the willows, we note the statement that "perhaps no other state in the United States possesses so many different kinds of willows as Wyoming." For Wyoming, it is said, Mr. Bebb suggested "Willow State" as a suitable name.

Part 20, of Pittonia, issued by signatures from January to April, 1899, contains several papers relating, in whole or in part, to Western America: "New species of Castilleia;" "New Western Species of Rosa;" "New Choripetalous Exogens;" "Notes on Machæranthera," and descriptions of various new species. The perennial creeping Lippias, with sessile forked hairs, are separated from that genus by Prof. Greene and renamed under Loureiro's name of Phyla.

Mr. J. B. Davy, Assistant Botanist to the University of California Agricultural Experiment Station, has been engaged during the months of June and July in field-studies and in making collections of the grasses and economic plants of the north Coast-Ranges from Ukiah to Crescent City. He was accompanied in his botanical wanderings by Mr. W. C. Blasdale, who made, for the most part, collections of fungi.

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EDITED BY

WILLIS LINN JEPSON,

Instructor in Botany, University of California.

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TERATOLOGICAL NOTES ON ESCHSCHOLTZIA CALIFORNICA.

A curious instance of fasciation in a plant *of Eschscholtzia Californica was recently brought to my notice by Mrs. G. P. Thomas, of Ocean View, near San Francisco. It was a remarkable monstrosity, consisting of thirteen to twenty flowers surmounting a flattened ribbed stem two inches wide. The stem flared at the top as in common cultivated Cockscomb. The flowers were so grown together, side by side, that it was not possible to ascertain definitely their number. The stem was leafy on the ribbon-like surface, and was branched below the fasciation.

Out on the sand-hills near Golden Gate Park an Eschscholtzia plant was found bearing flowers, all the petals of which were deeply lacinate. The flowers consequently presented a ragged appearance, as if they had been slashed by the wind. The gentleman who found it removed the plant to his garden. It is his intention to secure seed in order to preserve, if possible, the variation.

Miss Margaret Adamson sent me, from Larkspur, a specimen which bore, instead of the essential organs, a leafy branch and flower bud. Prolification is not unusual in this species. I remember finding several plants near Laundry Farm, in Alameda County, in which nearly all the flowers showed the same tendency.—Alice Eastwood.

On a small hilltop at Larkspur, Marin County, where the plants were scattered, I found nineteen Eschscholtzia plants, varying in the shape, number, and color of their petals. Color-variation is too common to be worthy of note in this genus, but it was the remarkable diversity in the shape and number of the petals that especially attracted my attention. There were many with pointed petals, giving the flower a star-like appearance; others with petals serrated, slashed and fluted. The first plant that I noticed had only two flowers, one with six and the other with five petals.

*An illustration of this plant appeared in the San Francisco Daily *Call* of March 19, 1898. For description of a very similar specimen, see Erythea, ii. 14.—Ed.

The following is a list of the variations that I recorded, but it does not, by any means, include all the peculiar cases observed:—

1. 4 outer petals, 5 inner.
2. 4 " " 4 "
3. 4 " " 2 "
4. 4 pointed petals and 1 round.
5. 12 petals.
6. 4 outer petals and 3 inner.
7. 4 " " " 9 "
8. 4 " " " 6 "

There were plants with flowers having 4, 5 or 6 petals; others with flowers having 4 to 8; others with flowers having petals all of the same number.—MARGARET E. ADAMSON.

OF ABNORMAL forms, Eschscholtzia Californica is exceedingly prolific. No other California plant has contributed so many cases to my teratological record in the last four or five years as this species. Some of these examples are of interest and will hereafter be published.—ED.

SHORT ARTICLES.

HEREDITY OF FASCIATIONS.—In a highly interesting article, which appeared in Vol. VI., 1894, of "Het Botanisch Jaarboek," published by "Dodonea," a Botanical Society of Ghent, Belgium. Prof. Hugo de Vries discusses the results of a large number of experiments on Crepis biennis fasciata and other plants, carried on by him, to determine, if possible, the heredity of fasciations. After calling attention to the well-known case of fasciations in Celosia cristata, Professor de Vries goes on to say, that the older teratologists did not consider fasciation to be hereditary, to which opinion the experiments of Gordon* contributed not a little. The latter made a single experiment with but one fasciated plant (Picris hieracioides), and not obtaining fasciation in the second generation, concluded its non-heredity.

*Gordon, A. Mélanges de Tératologie végétale. Mém. des sc. nat. de Cherbourb. T. XVI., 1871–72, pp. 97 and 112.

De Vries, however, considers monstrosities, with exception of the becoming green of parts of the flower, to be hereditary, and believes that by selective sowing we may succeed in fixing them. Of course, we will not always be successful in obtaining the desired fasciation, but there is little doubt, that under proper conditions fixation is possible in all cases. The grounds for his conclusion are the following:—

1. The occurrence of fasciated races (Hesperis matronalis, etc.), and especially the omission of whole generations by the monstrosity, (Helianthus annuus, Tetragonia expansa.)

2. The occurrence of fasciation during a series of years, in certain annuals and biennials.

3. The recurrence of fasciation in a larger or smaller number of individuals in the same locality in consecutive years, in the case of certain annuals and biennials. (Picris hieracioides, Oenothera biennis.)

4. The repeated occurrence of fasciation in the same plant, or in a number of plants, propagated by cuttings. (Lilium speciosum album corymbiflorum, a fasciated variety of Fritillaria imperialis and in numerous others.)

5. The repetition of fasciation for a number of years in perennial and in ligneous plants. In this case fasciations seemed to be repeated in favorable years, just as a larger amount of nutriment seems to bring about the occurrence of a large number of fasciations in annuals and biennials.

During his experiments Professor de Vries succeeded in producing fasciated races which seem to be well fixed, and he also observed that fasciated plants may be obtained from seed chosen with another purpose in view. Only in such cases, fasciations are less numerous and often intermittent. As an example we give here an account of his experiments upon Amarantus speciosus, conducted for the purpose of producing a race or races with the cotyledons variously split. A plant of Amarantus speciosus was raised from a seed, one of the cotyledons of which was split. This plant, on flowering, produces a fasciated inflorescence. From its seed 50 plants were obtained in 1890, one of which possessed a fasciated inflorescence. The seed for the next generation was not obtained from the fasciated individual just mentioned, but from one in which

one of the cotyledons was split. In this generation fasciation was absent, but in that of 1892 it reappeared in large numbers, 7 of the 24 plants being fasciated. The seed for 1893 was chosen from 2 non-fasciated individuals, but which might have been pollinated by fasciated plants. In that year 40 plants were obtained, more than half of which had a fasciated inflorescence. The results of this experiment were in short as follows:—

1889.—1st generation: 1 plant with fasciated inflorescence.
1890.—2d generation: 1 fasciated plant in 50 individuals.
1891.—3d generation: no fasciation.
1892.—4th generation: 30 per cent fasciation.
1893.—5th generation: over 50 per cent fasciation.

Intermittent fasciation was observed in 10 other species, wild or cultivated.

Repeated fasciation was observed in 13 species of perennial plants and in 6 species of ligneous plants.

These experiments, together with the fasciated varieties of commerce, such as Celosia cristata, Sedum reflexum monstruosum, Sedum arboreum cristatum, the well-known monstrous Cacti, and shrubs such as Sambucus nigra fasciata, and Euonymus japonicus fasciatus, seem to prove that fasciations are hereditary.—H. T. A. Hus.

Parnassia Californica Greene:—In November of 1898 this species was found by the writer on Mt. Tamalpais, Marin County, growing in a springy place near the spot where the Azaleas are always in bloom on the Bootjack trail. But one other locality is known in the Coast Ranges of California, "mountains above New Almaden," J. B. Davy.—Alice Eastwood.

NEWS NOTES AND CURRENT COMMENT.

Dr. A. W. Chapman, the venerable southern botanist, author of the well-known and widely-used Flora of the Southern United States, died at his home in Florida in April. A biographical sketch by Dr. Charles Mohr, of Mobile, Alabama, was published in the June number of the *Botanical Gazette*.

PART II, 2d Ser. Minnesota Botanical Series contains, among other papers, the following: Seedlings of Certain Woody Plants, Francis Ramaley; Contribution to the Life History of Rumex, by Bruce Fink; Observations on Gigartina, by Mary E. Olson; Seed Dissemination and Distribution of Razoumofskya robusta, D. T. MacDougal; Observations on Constantinea, E. M. Freeman.

BULLETIN No. 13 of the U. S. Division of Forestry is a report on the Red Desert of Wyoming, by Prof. Aven Nelson. The report is primarily an account of the forage resources of the region, but preceding the annotated list of the Red Desert flora, we find an account of the topography, geology, composition of alkali in Red Desert soils, temperature, rainfall, water-supply, seasonal vegetation, and the types of vegetation. This survey, which is similar in character to those advanced by the Division of Botany, is something of a departure for the Division of Agrostology.

IN THE MOUNTAINS of western America the botanical explorer has long had variable, and on the whole satisfactory, experience with the burro, a small donkey, as an agent for the transportation of his scientific and other supplies, but for a truly unique method of collecting, see Professor Hitchcock's relation of his botanizing in Florida, published in the Kansas *Industrialist*. He walked—for this is one of the best ways—and transported his camping outfit, weighing about eighty pounds, on a specially contrived wheelbarrow, which he trundled before him. In 24 consecutive days he walked 242 miles, and his expenses averaged 30 cents a day.

"THE PRINCIPLES OF AGRICULTURE" is an attractive-looking book, by Prof. L. H. Bailey, which is designed as a text-book for school and rural societies. The more strictly botanical part is found in a well-written chapter on "How the Plant Lives," by B. M. Duggar. Prof. Bailey, in the first sentence of his preface, remarks that "the greatest difficulty in the teaching of agriculture is to tell what agriculture is . . . every one, since the establishment of the agricultural colleges and experiment stations, is certain that it is a science. The fact is, however, that agriculture is pursued primarily for the gaining of a livelihood, not for the exten-

sion of knowledge; it is, therefore, a business, not a science." [MacMillan, New York. $1.25.]

M. Charles Naudin describes in the *Bulletin de la Société Nationale D'Acclimation de France*, for June, 1898, p. 177, a hybrid between two distinct species of Campanula, C. isophylla and C. fragilis, the cross having been made by an English horticulturist, William Mitten. The hybrid is said to be most remarkable; not only is it not intermediate between its parents, but its characters are such as to exclude it from the Campanulaceæ and constitute a new genus. Briefly the characters of the flower are as follows: The normal calyx is replaced by a verticil of five petioled leaves, with large blades, having all the appearance of other leaves of the plant; in the center of this verticil is the sympetalous corolla, conforming to the normal type and bearing five stamens, and most singular of all, the ovary is entirely free. The hybrid has been named Campanula Balchiniana by Mr. Mitten.

The books and papers written by Rafinesque, including those of botanical leanings, have in recent years become very scarce. For the conchologist, his conchological writings were several years ago reprinted, and for the ichthyologist the same thing has now been done for his account of the fishes of the Ohio. A reviewer in the *Nation*, with the latter reprint as a topic, acknowledges that the paper lies at the foundation of the investigation of the fresh-water fishes, but comments upon the mythical species added through the practical jokes of Audubon and the "torment caused to the systematic naturalist by Rafinesque's ill-digested, imperfect, and latterly more or less irrational work," and adds: "We have not yet heard that any meteorologist has reproduced the tract in which this half-crazy systematist described a large number of genera and species of thunder and lightning." However, we should be glad to see Rafinesque's botanical writings reprinted and made generally accessible. It would at once produce a reaction against an acceptance of Rafinesquian names in botany.

Bulletin No. 4 of the New York Botanical Garden, in addition to various official reports, contains several "botanical contributions,"

the most important of which is an account of "The Cæspitose Willows of Artic America and the Rocky Mountains," by Dr. P. A. Rydberg. From the inside of the cover we learn the personnel of the garden staff, which is as follows: Dr. N. L. Britton, Director-in-chief; Dr. D. T. MacDougal, Director of the Laboratories; Dr. John K. Small, Curator of the Museums; Dr. P. A. Rydberg, Assistant Curator; Samuel Henshaw, Head Gardener; George V. Nash, General Assistant; Willard N. Clute, Assistant; Percy Wilson, Assistant. It was expected that the Museum Building would be ready for occupancy "about midsummer." When completed it will receive not only the Botanic Garden's Herbarium of over 30,000 specimens, but also that of Columbia University, which contains about 500,000 specimens. Graduate students in botany of Columbia University will, hereafter, pursue their work at the Laboratories of the New York Botanical Gardens, and only undergraduate courses will be given at the University. The garden is soon to institute a series of memoirs, of which the first volume, "An Annotated Catalogue of the Flora of Montana and the Yellowstone National Park," by A. P. Rydberg, it is announced, will appear this year.

A SECOND INSTALMENT of Miss Eastwood's "Studies in the Herbarium and the Field" forms No. 3 of Vol. 1., Proceedings of the California Academy of Sciences (Botany). In it we find three new species of Cnicus from southern Colorado and Utah, a paper on the Colorado Alpine species of Synthyris, and further observations on the manzanitas of Mt. Tamalpais. Of new species there are several. The plant of Mt. Tamalpais usually referred to C. exigua Rattan is named as distinct, its designation to be Campanula augustiflora Eastwood. This separation seems to be well taken, although we doubt if the amount of variation in the original form is well known. Plants in the University of California Herbarium from the type locality of C. exigua, *i. e.*, Mt. Diablo, exhibit corollas quite different as to the lobes from the one figured in Miss Eastwood's paper. Romneya trichocalyx is segregated from R. Coulteri. Sedum Congdoni from Mariposa County, is new; its nearest relative is S. pumilum Benth. Cercocarpus Traskiæ is a novelty, the locality of which is not distinctly specified, but

one can safely infer from the context that it is Santa Catalina Island. Calochortus Purdyi is another new species, this being from the Willamette Valley. From a collection of plants made by Mrs. Blanche Trask, the author gives us our first knowledge of the plants of San Nicolas Island, the list of seed-plants footing up a total of eighty species, of which nine are new species and several more new varieties. Under Malacothrix implicata, sp. nov., is made the following admission: "It has been extremely puzzling to know what to do with this. It might just as well be made a variety of *M. saxatilis*." A valuable table at the end shows in a graphic way the occurrence or non-occurrence of the species of St. Nicolas on the other islands of the Santa Barbara Channel group and on the mainland. Of new species here proposed, the author has not found it possible to illustrate the plants entire, but only those organs or parts of organs selected as most distinctive. Few authors do so much, and this should be regarded as one of the best features of Miss Eastwood's work; one can readily appreciate the value and nature of the propositions advanced as new.

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NEW OR LITTLE-KNOWN PLANTS OF SOUTHERN CALIFORNIA.—II.

By S. B. Parish.

Pinus Parryana, Engelm. Am. Jour. Sci. Ser. 2, xxxiv. 332. This Lower California pine has been discovered by Mr. H. M. Hall on the desert slope of Santa Rosa Mountain, where it exists in considerable quantity at about 5,000 feet altitude. Santa Rosa Mountain is a southern continuation of the San Jacinto Mountains, and is within the boundaries of Riverside County. It and the adjoining El Toro Mountain constitute an interesting region, which Mr. Hall has been almost the only botanist to explore. Specimens of this pine reported * as collected in the San Jacinto Mountains by Mr. R. H. Asher, probably came from this station, since it may be regarded as certain that it does not exist in the San Jacinto Mountains proper. Mr. Hall also observed a single tree on Nigger Jim Hill, between Hemet and Coahuilla, in the intramontane region.

Chætochloa imberbis, Scribner, Bull. U. S. Div. Agrost, iv. 39. *Setaria imberbis*, R. and S. Syst. 2. 89, *S. caudata*, Davidson, Pl. Los. Ang. Co. 31, not R. and S. Syst. 2. 495.

Locally introduced at Los Angeles. *Hasse*, 1892; Davidson, 1894.

Eragrostis pilosa, Beauv. Agrost. 71. *E. Orcuttiana*, Vasey, Contrib. U. S. Nat. Herb. i. 269. *E. Mexicana*, McClatchie, Fl. Pasad. 628. Davidson, Pl. Los Ang. Co. 32, not Link. Hort. Berol. I. ix. 190. Locally introduced in the intramontane region, Los Angeles, *Davidson;* Pasadena, *McClatchie;* San Diego, 1885, *Orcutt;* Santa Ana, Oct. 1882, 1601 *Parish;* Lugonia, near Redlands, July, 1892, 2484 *Parish*.

Dr. Vasey proposed his *E. Orcuttiana* on the plant of Mr. Orcutt and my own No. 2484. The latter was a wayside waif which has not reappeared. My Santa Ana plants were growing along an irriga-

* West Am. Scientist, Vol. X, No. 81.

tion ditch, and were apparently not indigenous. Dr. Davidson's and Professor McClatchie's plants were collected by roadsides or in cultivated grounds. There can be no doubt of the exotic character of these plants. I reduce Dr. Vasey's species to *E. pilosa* on the authority of Dr. Scribner, who regards it as identical with Australian specimens referred to that species by Bentham. It is the form known as *E. parviflora*, Trin.

Nolina Bigelovii, Watson, Proc. Am. Acad. xiv. 246. I have specimens, with fruit and flowers, of this species, collected by Mr. J. W. Lester, in the foot-hills south of Corona (South Riverside). The seeds are ovate, about 5 cm. long, roughish and light-colored. The occurrence of any Nolina in this region was not to be looked for, or if any, one would rather expect *N. Parryi*. Yet the occasional appearance of desert plants in the intramontane region is far from unprecedented.

Lemna gibba, Linn. Sp. Pl. 970. Professor McClatchie has reported this species* from several stations near the coast. To these may be added an interior one, a small stream west of Mound City, in San Bernardino Valley.

Lemna minima, Philippi, Linnæa, xxxiii. 239. In ditches and in pools of a slow, shallow stream in swamps a mile south of San Bernardino.

Wolffiella oblonga, Hegelmaier in Engler Bot. Jahrb. xxi. 303.

Wolffiella lingulata, Hegelmaier, l. c.

These two minute plants occur at the last-mentioned station, entangled in an abundant growth of *Lemna minor*, Linn., and *L. minima*, Philippi. If some of this lemnaceous material be floated in a pan of water, it is easy to separate the slender fronds of *W. oblonga* from the broad ones with upcurved edge of *W. lingulata*. But when this has been done, there remain a number which it is difficult to assign to either species with entire certainty. So that, while typical forms are perfectly distinct, it may be questioned, if further knowledge may not show that in reality they are extreme

* Eryth. iv. 9.

forms of a single variable species. The difference said to be shown in the stipe-scar I have not been able to make out.

In a series of collections made in 1898 no Wolffiellas could be found till early in July, when a few specimens of *W. lingulata* were detected, but none of the other species. August 15th *W. lingulata* had increased in quantity, but was still scarce, and a few doubtful specimens of *W. oblonga* could be separated. On September 17th there was an abundance of *W. oblonga*, and it was not difficult to find good typical fronds of *W. lingulata*. On November 19th, when the next and last examination was made, the Wolffiellas had mostly disappeared, many fronds were dead, and of those living more than half belonged to *W. oblonga*.

ATRIPLEX BREWERI, Watson, Proc. Am. Acad. ix. 119. *A. orbicularis*, Watson, l. c., xvii. 377. On the bluffs of the seashore. San Juan, *Alderson*. Santa Monica, *Hasse, Parish*.

Santa Monica is the type locality of *A. orbicularis* and in part of *A. Breweri*. The first is monœcious, while the second was characterized as "mostly dicœcious." It is certainly sometimes monœcious, and probably mostly so. In one of Dr. Hasse's specimens the inflorescence is of short axillary panicles, leafy, or naked, the lower panicles made up of spikelets of all staminate flowers, and the upper panicles of spikelets pistillate at base and staminate above. These latter exactly represent *A. orbicularis*, so that if the specimen were broken in half, the upper portion would agree with the character of that species, while the lower half would answer for a staminate specimen of *A. Breweri*. In habit, leaves, and bracts there is no difference between the two supposed species.

SALICORNIA HERBACEA, Linn. Sp. Pl. Ed. 2, 5. Coast of San Diego County, near the Boundary Monument, Nov. 1898, *Brandegee*. A plant of low growth and compact habit, but in other respects possessing the characteristics of this species. I am not aware that this and the following species have been collected heretofore in California.

SALICORNIA MUCRONATA, Bigelow, Fl. Boston. Ed. 2, 2. *E. Bigelovii*, Torrey, Bot. Mex. Bound. 184. Britt. & Brown, Ill. Fl. i. 583. San Diego, November, 1898, *Brandegee*.

SALICORNIA SUBTERMINALIS, Parish, Eryth. vi. 87. I now have this from Santa Monica, *Hasse*, and San Diego, *Brandegee*. At the latter place it is said to be the most abundant species. In fruiting specimens the terminal joints are not always present, being probably deciduous. But the plant is readily recognized by its habit and the enlarged fruiting joints.

ESCHSCHOLTZIA CALIFORNICA, Cham. in Nees, Horæ. Phys. Berol. 73, t. 15. San Gorgonio Pass, from Belmont to Banning, altitude about 3,000 feet. Upper Lake at Bear-Valley in the San Bernardino Mountains, at 6,700 feet altitude. Elizabeth Lake at 3,300 feet altitude.

Perennial from a fleshy root; foliage ample, its divisions mostly broad and obtuse; torus with a more or less expanded border; corolla large, orange-yellow, the earliest flowers not scapose.

Restricting the species to the perennial plant above indicated, it is rare in Southern California. The perennial character appears to be inherent and not to depend directly upon the conditions to which the plant is subjected, as has been conjectured to be the case in some localities. In the San Gorgonio Pass the plants grow in a hard, red clay, which becomes thoroughly dry in summer, and the plants vegetate only during the rainy season, flowering in early spring, the root soon becoming dormant. At Elizabeth Lake they grow on dry hillsides, and were still flowering in June. Those in Bear-Valley endure the rigors of a Sierran winter. They grow mostly on a subalkaline flat, the only case where they have a permanently damp soil, but they also extend up the adjacent gravelly hills above the moisture of the basin. Except at the last station they are accompanied by the very similar *E. peninsularis*, Greene, which is distinguishable only by its annual root, and the early scapose flowers common to many, and probably to all, the annual forms.

WHIPPLEA MODESTA, Torrey, Pac. R. Rep. iv. 90, t. 7. A considerable patch on a gravelly slope, under *Quercus agrifolia*, in the cañon leading from Yucaipe, near Redlands, to San Timoteo, at about 2,000 feet altitude, July 6, 1899. This extends the southern limit of the species far beyond previously reported stations, and to a

section where plants of the coast range flora would not be expected. Only foliage was seen, the reproductive season being past, but there is no doubt of the identity. The plants are slender and erect, and the leaves, although thin, are not membranaceous.

LUPINUS SITGREAVESII, Watson, Proc. Am. Acad. 8. 527. Bluff Lake, in the San Bernardino Mountains, at 7,400 ft. alt. *Miss Pettibone.*

Euphorbia arenicola. *Anisophylli;* annual, with prostrate stems; leaves distant, thin, glaucous, ovate-lanceolate, entire, 2 mm. long; stipules short, setaceous, entire, or few-cleft; involucres solitary, broadly campanulate, ciliate, 2–3 mm. long; glands 4, sessile, emarginate and concave, yellow; capsule depressed-globular, 2 mm. long and as broad, strongly deflexed; seed ovate, smooth, ash-colored.

Sand hills in the Mojave Desert at Camp Cady, May, 1882, 1370 *Parish.* Distributed as *E. cuspidata*, Engelm MS., a preoccupied name.

CEANOTHUS GREGGII, Gray, Pl. Wright. ii. 28. Cushenberry Springs, on the desert base of the San Bernardino Mountains, May, 1882, 1620 *Parish.* Leaves elliptical, 6–8 mm. long, all spinosely few-toothed.

Sidalcea nitrophila. Root thick but not lignescent; the whole plant glabrous except the leaves and calyx, which are very sparsely hirsute with short, simple hairs; leaves mostly broad, thin, orbicular, sharply and irregularly toothed, 6–18 mm. wide, on petioles 3–5 cm. long; stems few, 15–20 cm. high; inflorescence paniculate with few and short branches; flowers rather distant, on pedicels 4–6 mm. long, which are subtended by short and slender bifid bracts; corolla 8 mm. high, light-purple; stamineal phalanges indistinct; mature carpels entirely smooth, 2 mm. high, their short, subulate beaks erect.

In alkaline meadows at Rabbit Springs, alt. 3,000 ft., in the Mojave Desert, May, 1886, 1804 *Parish.*

Nemophila sepulta. Hirsute; stems 5–8 (rarely 15) cm. long, procumbent; leaves usually approximate, opposite, oblong in outline, 12 mm. (rarely 5 cm.) long, the lower half narrowed into

a margined petiole, above pinnately parted nearly to the midrib into 5 or 7 equal, oblong, entire, mucronulate lobes; flowers on slender peduncles, soon deflexed, and burying the capsule more or less in the soil; lobes of the calyx triangular-acuminate, ciliate, the appendages nearly as long as the lobes; corolla very small (4–6 mm. in diameter), little exceeding the calyx lobes, white, its appendages minute, consisting of narrow vertical folds, ciliate with 1–3 short hairs; ovules 4; mature capsule 4–6 mm. in diameter, much exceeding the calyx lobes; seeds 4, irregularly triangular, rounded on the back, obscurely pitted, and with a conspicuous caruncle.

In rich soil, in meadows at Bear Valley, 6,500 ft. alt., in the San Bernardino Mountains, June, 1895, 3782 *Parish*, and other distributions. In some respects approaching *N. Menziesii*, H. & A., from which it differs in its condensed and prostrate habit, much smaller flowers, less deeply-parted style, and notably in the number and shape of the much larger seed.

Polemonium cœruleum, Linn. Sp. Pl. 162. A single specimen collected at Bear Valley in the San Bernardino Mts., July, 1899, *H. M. Hall.* This is far the most southern station yet reported for this plant in California.

Gilia (Leptodactylon) Hallii. Stems woody below, set with opposite fascicle-like buds made up of short acerose scales, the upper buds producing slender, puberulent flowering branches, 10–12 cm. long; their leaves opposite, palmately 3-parted to the base, the divisions acicular, the central one (7–8 mm.) thrice longer than the laterals; flowers few, clustered at the summits of the branches; calyx hyaline-membranaceous with green ribs which are prolonged into unequal acerose teeth; corolla "white," or ochroleucous, becoming yellow in drying, funnel form; tube 6 mm. long, scarcely exceeding the calyx, the throat only moderately enlarged; lobes obovate, 5–6 mm. long; anthers oblong (2 mm.), inserted on the throat, nearly sessile; styles only 2 mm. long, the slender stigma branches 4 mm. long; ovules reniform, 4 in each cell.

Coyote Cañon, at 5,000 ft. alt., on the desert slope of El Toro Mt., May, 1899, *H. M. Hall.* This plant has technical characters of both Leptodactylon and Siphonella, but by its habit and aspect

is clearly of the former section. It is a pleasure to give it the name of its discoverer, whose explorations have made numerous interesting additions to the Southern California flora.

Gilia (Leptodactylon) tenuiloba. Stems slender, sublignescent below, puberulent, 8–10 cm. high, few-branched near the ends; leaves alternate, not longer (5–10 mm.) than the internodes, palmately 3-parted, or becoming pinnate with 1–2 pair of lateral divisions, in either form the central division 2–3 times longer than the laterals, all the divisions linear, or very narrowly spatulately enlarged above, pungent, the leaves on the ultimate branchlets undivided; flowers solitary, terminating the branchlets; calyx 6–8 mm. long, the sinuses hyaline membranaceous, the linear green ribs prolonged into short, nearly equal, acerose teeth; corolla funnelform, light yellow; tube slender, 10–13 mm. long, slightly enlarged at the throat; lobes as long as the tube, linear oblong; anthers included, ovate, 1 mm. long, on filaments of the same length, inserted near the base of the throat; styles 2 mm. long, stigma lobes 3 mm. long; ovary oblong, acute; ovules about 6 in each cell.

San Jacinto Mountains, probably in Tanquitz Valley, July, 1880, 689 *Parish.*

Oreocarya leucophæa **confertiflora.** *O. confertiflora* Greene, Pitt. iii. 112. Arid hillsides on the desert slope of the San Bernardino Mountains, from Cushenberry Springs, alt. 4,500 ft., to Rose mine and Bear Valley, alt. 6,500 ft. The subcapitate inflorescence of the type specimen of *O. confertiflora* was exceptional. Normally the inflorescence is glomerate-spicate, precisely as in *O. leucophæa*, from which the present variety is distinguished by its broad, depressed nutlets, those of the species being acute. Dr. Purpus has collected the same plant in the Argus Mountains of Inyo County.

Oreocarya abortiva, Greene, Pitt. iii. 114. Common on dry, gravelly slopes in open pine forests, at Bear Valley, in the San Bernardino Mountains. The whole plant more or less sparsely hispid, as well as silky canescent; nutlets usually all 4 maturing, and then loosely connivent, and less incurved than when by abortion solitary; their dorsal surfaces entirely smooth. Originally character-

ized from abnormal specimens in which all but one of the nutlets had aborted.

Monardella linoides **stricta.** Stems herbaceous, slender, branching only at the base, puberulent or glabrous, green; leaves linear to narrowly-oblong, 15–18 mm. long, or the basal ones ovate and only 4–5 mm. long; floral bracts membranaceous, tinged with purple or red.

Dry hills, Bear Valley, July 30, 1884, 2077 *Parish.* Bluff Lake, alt. 7,500 ft. in the same region, Aug. 1895, *Miss Nora Pettibone.*

Calamintha mimuloides, Benth. Pl. Hartw. 33. Head of Cottonwood Cañon, at 4,000 ft. alt., in the mountains near Acton, Los Angeles Co., Aug. 23, 1893, *Dr. Hasse.*

Herbaceous, 50–60 cm. high, viscidly hirsute, fragrant; leaves thin, ovate, 2–3 cm. long, coarsely toothed; flowers usually 3 in each axil, on slender pedicels, leafy-bracted at base; calyx tubular, 7 mm. long, 13-nerved, obscurely bilabiate, the cuspidate teeth nearly equal; corolla dull red, sparsely villous, tubular, enlarging in the throat but not gibbous, 4 cm. long, bilabiate; lips straight, 5 mm. long, the upper deeply 2-lobed, villous within, the lower more deeply 3-lobed; filaments didynamous, the upper pair higher inserted, convergent, included under the upper lip, all antheriferous; style exsert, its branches unequal; ovary on a short columnar gynobase; nutlets all 4 usually maturing, globose, light colored, perpendicularly veined.

Collinsia callosa. Plants 15–30 cm. high, dichotomously branched, glabrous except the slightly glandular pedicels and calyces; leaves opposite or ternate, oblong to acutely ovate, 2 cm. or less in length, the upper much reduced, sessile, entire, the margins somewhat revolute; flowers in verticils of 2 or 3, or solitary, on slender pedicels about 1 cm. long; calyx lobes acute; corolla light blue, 5–8 mm. long, the lips about equaling the moderately gibbous throat, their lobes all entire and of equal length, the lower lip with prominent internal callosities below the sinuses; filaments glabrous, the abortive one filiform, 1 mm. high; style 4 mm. long, stigma entire; mature capsule globose, shorter than the calyx lobes; seeds 3 in each cell, oblong-meniscoidal, 3 mm. long, reticulately rugose.

Swarthout Cañon, in the San Antonio Mountains, at 6,500 ft. alt., June, 1899, 1267 *H. M. Hall.*

GALIUM WRIGHTII, Gray, Pl. Wright. i. 80. On San Antonio Mountains at 5,000–7,000 ft. alt., Aug., 1893, *Prof. McClatchie.*

CNICUS HALLII, Gray, Proc. Am. Acad. xix. 56. In a meadow at the Yucaipe Schoolhouse, near Redlands, at about 2,000 ft. alt., July, 1899.

CYNARA CARDUNCULUS, Linn. Sp. Pl. 827. Rare as a wayside escape at San Bernardino. Abundant and well established over a hillside pasture at Trujillo's Ranch, on the road from Rincon to Smith's Mountains, San Diego Co., June, 1897.

ERIGERON BREWERI, Gray, Proc. Am. Acad. vi. 541. Hesperia (near the schoolhouse), at about 3,500 ft. alt., at the desert base of the San Bernardino Mts., June, 1895.

CHRYSOPSIS FASTIGIATA, Greene, Pitt. iii. 296. Common in dry plains or washes throughout the intramontane region below 3,000 ft. alt. Witch Creek, *Alderson.* Santa Monica, *Hasse.* Los Angeles, *Davidson.* Pasadena, *McClatchie.* San Bernardino (type); Murrietta; Temecula. Also in the desert region at Whitewater. July–November.

Plants 3–8 dm. high, erect or spreading; spring leaves 3–5 cm. long, oblong-spatulate, narrowed to a margined petiole, mucronate, lax, clothed with a pubescence denser and softer than that of the later leaves, soon withering and leaving the main stems naked; rameal leaves small (5 mm.), oblong-acute, closely sessile, rigid, appressed, together with the branches somewhat viscid and canescently villous with long, softish hairs; involucre cylindrical; scales in 5 series, villous; rays 8–12, ligules ovate, 5 mm. long, minutely 3-toothed at the summit; short outer pappus distinctly squamellate; hairs of the achene toothed at apex.

The amount and softness of the villousness vary considerably in different specimens, being mostly more copious and softer in those from the desert and from near the coast than in the San Bernardino plants. The short outer pappus is readily seen with a hand lens, but its squamellate character is more apparent under a low power of the microscope. The plant is of the *C. villosa* group and is included in *C. villosa echioides*, Gray, Syn. Fl. I. ii. 123, but is too hastily placed by its segregator in the Ammodia section, of which it has none of the technical characters, nor has it the aspect of the plants of that section.

SOME CALIFORNIAN UREDINEÆ.

By E. W. D. Holway.

A preliminary list of the Uredineæ of California recently made shows in Puccinia, 122 species; in Uromyces, 42 species; and of other genera, 73 species. This is a very large number when it is remembered that only a small part of the state has been explored. In compiling the list I found the following new species in my herbarium. They were submitted to Dr. Dietel, who sent me descriptions in German:—

Puccinia Palmeri (Anderson), Dietel and Holway. Æcidial stage = *Æcidium Palmeri* Anderson. Teleutospore-sori intermixed with the æcidia, small to medium size, at first covered by the epidermis, prominent, at length naked, dark brown; teleutospores oblong or elliptical, distinctly constricted, rounded at both ends, apex not at all or slightly thickened, often with a small papilla. 31–40x20–26μ; epispore smooth, brown; pedicel short, fragile.

On *penstemon confertus*, Lake Tahoe, July, 1897, W. C. Blasdale.

Uredo Gaillardiæ, Dietel and Holway. Sori scattered over nearly the entire under surface of the leaf, and sparingly on the upper, small, naked, dark brown; spores brown, obovate to globose 30–35x24–31μ; epispore thick, with short spines.

On *Gaillardia aristata*, Sisson, May, 1894, Holway.

Æcidium pseudo-balsameum, Dietel and Holway. Pseudoperidia in two rows, on the under side of the leaves, opening irregularly, composed of cells 40–50μ long, and 25–30μ broad, very coarsely tuberculate; spores globose to oblong, 23–28x19–21μ; epispore strongly tuberculate.

On Abies grandis, Eureka, June 4, 1896, W. C. Blasdale.

In habit and appearance of the spores, this species is much like *Peridermium balsameum*, Pk., but is readily distinguished by the extremely large warts of the peridial cells, those of *Peridermium balsameum* being quite small.

Æcidium Triglochinis, Dietel and Holway. Æcidia on all parts of the plant in irregular groups; on the stems often linear, and with spermagonia; pseudoperidia cylindrical on the pedicels, and almost hemispherical on the stems and leaves; spores polygonal or almost globose, 17–28x14–18μ, with a thin, finely tuberculate epispore.

On *Triglochin concinna*, Amedee, June 10, 1897, J. B. Davy. On Triglochin, Amedee, June 23, 1897, Marcus E. Jones.

NEW AND NOTEWORTHY NORTHWESTERN PLANTS.—I.

By C. V. Piper.

Sitanion latifolium. Culms tufted, erect or somewhat decumbent at base, stout, glabrous, terete, striate, about 2 dm. high; sheaths very loose, rather inflated, smooth and glaucous, strongly nerved, longer than the internodes, widely open at the throat; ligule obsolete; blades short, thickish, rigid, green and glabrous above, glaucous and prominently nerved beneath, 3–8 cm. long, 5–7 mm. broad, lanceolate, acute, flat, becoming involute at the margins; spike 4–6 cm. long, stout, erect, its base enclosed in the upper leaf-sheath; spikelets mostly three at each joint; empty glumes or their divisions mostly 8, sometimes 6, stout, subulate, flexuous, divaricate, 2–4.5 cm. long, scabrous on the nerves and awn; flowering glume 7–8 mm. long, lanceolate, glaucous, smooth near the base, scabrid near the apex, bifid, armed with a stout awn 1–3 cm. long; palet nearly equaling the glume, 2-toothed at the apex, scabrous on the nerves; internodes of the rachis flattened, broadest above, scabrous on the margins, 2–3 mm. long.

Blue Mts., Walla Walla County, Wash., 15 July, 1896. Nearly related to *S. rigidum*, J. G. Smith.

Sitanion flexuosum. (§ Elymoides.)—Culms densely tufted, 6 to 9 dm. high, terete, striate, smooth, shining; sheaths striate, closely fitting the stem, open in the throat, a little shorter than the internodes, those of the basal leaves sparsely villose, those of the culm glabrous; ligule minute; blades 4 to 12 cm. long, about 2 mm. wide, linear, acuminate, involute, strigose pubescent above, densely strigulose beneath, or the uppermost nearly glabrous; spikes slender, erect, flexuous, 8 cm. long, pale green, long exserted; spikelets one or two to each joint, broadly lanceolate, compressed empty glumes subulate-setaceous, 3 to 4 mm. long, 3 to 5 nerved scabrous on the back, tipped with an awn 9 to 10 mm. long, sometimes with two very short lateral ones in addition; flowering glume 8 mm. long, lanceolate, smooth and rounded on the back below, minutely scabrid and 5-nerved above, bifid, tipped with a

slender, divergent scabrous awn 3.5 to 4 cm. long; palet as long as the flowering glume and its teeth, scabrous on the nerves, obtuse; joints of the rachis 4 to 6 mm. long, flattened, linear, very slightly clavate thickened and scabrid near the apex.

In sandy soil, Wawawai, Wash., 17 June, 1899, C. V. Piper, No. 3004.

Sitanion Leckenbyi. Culms stout, erect, terete, striate, glabrous, pale green with brown nodes, 6–8 dm. high; sheaths ampliate and open at the throat, those of the culm shorter than the internodes and glabrous, those of the sterile shoots longer than the internodes and ciliate on the margins; ligule short, scarious; blades stiff, erect or divergent, 4–12 cm. long, 2–3 mm. wide, linear lanceolate, involute, glabrous beneath, strigose above, the attenuate apex very sharp; spikes 1–1.5 dm. long, rather slender, erect or sometimes flexuous, long exserted; empty glumes 4, equal, entire, narrowly setaceous, erect, 2.5–3 cm. long, scabrous the entire length; flowering glumes narrowly lanceolate, 8–9 mm. long, rounded on the back, the lower half smooth, the upper half scabrid, bifid at the apex and tipped with a straight, strongly scabrous awn, 3–4 cm. long; palet as long as the glume without the bifid apex, scabrous on the nerves, obtuse; joints of the rachis clavate, flattened, 5–8 mm. long, scabrous on the margins of the upper half, glaucous.

Sandy bars of Snake River at Wawawai, Wash., 17 June, 1899, C. V. Piper, No. 3003, and A. B. Leckenby. This species falls into J. G. Smith's § Horderiformæ.

Sitanion Brodiei. Culms erect 4–5 dm. high, smooth, terete, the nodes brown; sheaths striate, closely wrapping the stem, smooth, longer than the internodes, wide open at the throat; ligule very short, hyaline; blades stiff, smooth on each side, involute, lanceolate, sharply acuminate, 9–13 cm. long, 3–4 mm. wide; spike pale green, long exserted, stout, erect, 5–7 cm. long; empty glumes undivided, 7 mm. long, subulate, gradually attenuate into an awn about 10 mm. long, 2–3 nerved, scabrous on the nerves and awn; flowering glume lanceolate, rounded on the back, densely appressed pubescent, 10 mm. long, acuminate, attenuate into a scabrous awn 20–25 mm. long, sometimes with two very short

lateral awns; palet as long as the glume, scabrous on the nerves, bifid at apex; spikelets 2–3-flowered, one or two at each joint of the rachis, these linear, not at all clavate, flattened, scabrous on the margins, 6 mm. long.

Bishop's Bar, Snake River, Whitman Co., Wash., 7 July, 1893, D. A. Brodie. This species, like *S. anomalum* J. G. Smith, tends to invalidate the genus Sitanion. Only the jointed rachis and occasionally trifid flowering glume separate it from Elymus proper.

Elymus virescens. Whole plant bright green, glabrous except the inflorescence; culms tufted, dark brown at the nodes, about 6 dm. high; culm leaves four; sheaths of the lower leaves one-fourth longer than, of the second as long as, of the third one-fourth shorter than, the respective internodes; ligule very short, hyaline; spike 6–8 cm. long, erect, rather slender, dense; spikelets commonly in fours, sometimes single, mostly 3-flowered, 10 mm. long; empty glumes lanceolate, 7–8 mm. long, including the attenuate apex, 3-nerved, the nerves slightly scabrous towards the apex; flowering glumes lanceolate, obtuse, slightly scabrous on the back, 5–7-nerved, 8–10 mm. long, with a minute awn 1 mm. long; palet 7–9 mm. long, scabrous-ciliate on the nerves; joints of the rachilla scabrous.

Based on my No. 1988, collected in damp coniferous woods, 3,000 ft. altitude, Olympic Mts., near the head of the Duckaboose River, August, 1895. In the same place was collected *Elymus ciliatus* Scribn., since described from Alaska specimens. The new species is apparently nearest to *E. glaucus* Buckl., from which it is at once distinguished by its bright green color and almost awnless flowering glumes.

Elymus condensatus **pubens.** Smaller than the typical form in every way, about a meter high; culms pubescent with short white hairs, especially near the nodes; sheaths villose-pubescent with rather long white hairs, especially the lower ones; blades glabrous; the whole inflorescence rather minutely puberulent.

Growing with the typical form in strong alkali soil near Yakima City, Wash. Collected 10 July, 1897. No. 2591.

Poa Olneyæ. Perennial with running root-stocks; culms tufted, 6–8 dm. high, terete, striate, glabrous, pale green, the nodes

brownish; leaves of the sterile shoots rather numerous, the blades about 2 dm. long, flat or equitantly folded, cuspidate pointed, perfectly smooth; sheaths smooth, about half as long as the blades, the ligule obsolete; culm leaves 3, the blades flat, cuspidate pointed, 3–6 cm. long, 2–3 mm. wide, smooth at base, minutely scabrous on each side towards the apex; sheaths smooth, shorter than the internodes, the ligule 1 mm. or less in length, hyaline; panicle pale green, lax, more or less drooping, about 1 dm. long, narrow; rays 3–5 at each node, slender, flexuous, rather erect, sparsely scabrous, the longest not exceeding 5 cm.; spikelets ovate-lanceolate, acutish, 7–10 mm. long, on pedicels about as long, 4–6-flowered; empty glumes subequal, membranous, the lower 3–3.5 mm. long, acute, narrowly hyaline margined, 3-nerved, the lateral nerves short or sometimes obsolete, the mid-nerve sparsely scabrous; the upper acute with a broad scarious margin, 4 mm. long, 3-nerved, sparsely scabrous on the nerves and on the scarious margin; flowering glumes membranous, ovate, 5 mm. long in the lowest florets, narrowly scarious margined, acutish, 5-nerved, the nerves scabrous; palet nearly as long as the flowering glume; scabrous-ciliate on the two nerves, sharply acute; joints of the rachilla sparsely scabrid.

Base of basalt cliffs in pine woods, Spokane, Wash., 28 May, 1898, No. 2820. Named in honor of Mrs. Mary P. Olney, well known as a conchologist, to whom I am indebted for many botanical favors.

This Poa is one of the most beautiful known to me and will doubtless prove of value agriculturally. Perhaps nearest *P. Wheeleri* Vasey.

Poa Spillmani. Perennial, pale green, in dense tufts; culms 6–7 dm. high, smooth below, scabrid above, terete, striate; basal leaves numerous, the blades erect, narrowly filiform, involute, scabrous, 2–3 dm. long; sheaths smooth, about 1 dm. long, the old ones persistent; ligule minute; cauline leaves 2, filiform, involute, the scabrous blades 5–6 cm. long, 1 mm. wide, the nearly smooth sheaths shorter than the internodes; ligules hyaline, acute or obtuse, 1 mm. long; panicle narrow, erect, not dense, 1 dm. or less long; rays erect, slender, more or less flexuous, mainly in threes and fours, scabrous on the angles; spikelets 5–9 mm. long, ovate, acute, loosely 4–7-flowered, on stout pedicels usually shorter than

the spikelets; lower empty glume broadly lanceolate, 3-nerved, 3–3.5 mm. long, hyaline margined, scabrous on the midrib and margins; upper empty glume ovate-lanceolate, 3-nerved, 3.5–4 mm. long, acuminately acute, scabrous on the midrib and hyaline margins; flowering glumes, 5-nerved, 5 mm. long, scabrid all over the back, acute, membranous, hyaline margined; palet nearly as long as the flowering glume, ciliate on the upper half or two-thirds of the nerves; rachilla appressed scabrous.

Douglas Co., Wash., between Coulee City and Waterville, 27 May, 1896, Prof. W. J. Spillman.

DANTHONIA SPICATA **pinetorum**. Culms tufted, 5–7 dm. high, terete, glabrous except the lowermost nodes, which are pubescent; basal leaves rather numerous, curled, the blades narrow, involute, 1 dm. or less long by 2 mm. wide, sparsely villose pubescent on the under side, especially toward the base, scabrous on the margins toward the apex; sheaths short, about 1 cm. long, mostly glabrous, widely open, the ligule represented by tufts of bristles; cauline leaves four, not curled, the sheaths one-half the length of the internodes, or less; blades of the two lowermost more or less villose on the upper side, their sheaths glabrous except at base; the upper leaf-blade very short, all more or less scabrous on the margins, the ligule represented by a few bristles or obsolete; inflorescence racemose or paniculate, narrow, 2–5 cm. long, with 6–12 spikelets; spikelets 5–7-flowered, 10–11 mm. long, including awns, on erect pedicels; lower empty glume 11 mm. long, lanceolate, acuminate, broadest just below the middle, 3–5-nerved, glabrous, with a broad hyaline margin; upper empty glume similar and as long, mostly 5-nerved; flowering glumes obscurely 7-nerved, 6 mm. long, including the teeth, which are 2 mm. long, sparsely strigose pubescent and towards the base ciliate with white hairs; awn brownish, scabrous, 6–7 mm. long, usually twice twisted at base; palet reaching to the base of the teeth of the flowering glume.

Based on my No. 943, collected in dry open coniferous woods, in gravelly soil, Mason County, Wash., 3 miles south of Union City, 13 July, 1890. Dr. Vasey referred the plant to *Danthonia intermedia* Vasey, from which it is markedly different in its taller

habit, smaller spikelets and very unlike leaves. Although the plant occurs widely separated from the range of *D. spicata* R. & S., it is scarcely more than a variety of that species, differing mainly in character of pubescence.

Trillium crassifolium. About 2 dm. high, from an erect root-stock, 2–3 cm. long; leaves ovate, not at all rhombic, 4–5 cm. long, 2–4 cm. wide, thickish (chartaceous when dry), abruptly acuminate near the apex, sessile by a broad base; pedicel erect, about 1 cm. long; petals white or pinkish, broadly to rather narrowly lanceolate, acuminate or acute, scarcely as long as the sepals, 2–2.5 cm. long; sepals narrowly or broadly lanceolate, acute.

On damp hillsides, foot-hills near Wenatchee, 30 April, 1899, Kirk Whited. Near to *T. ovatum* Pursh, from which it differs in its erect rhizomes, shorter petals, and thickish differently shaped leaves. The specimens are in young flower only, but in the dried plants the petals are pinkish.

VEGETATION OF THE SUMMIT OF MT. ST. HELENA.

By Willis L. Jepson.

The mountain mass of Mt. St. Helena is exceeded in height by no point in the Coast Ranges between Clear Lake and the Peak of San Carlos, saving only Mt. Hamilton. Its highest point is 4,343 feet above sea level, or exactly one hundred feet less than that of the mountain last named. It is the culminating point of the middle Coast Range, locally known as the Mayacamas Mountains, a range of north and south trend, which secludes the Clear Lake region on its east and extends southward to the Carquinez Straits (connecting the bays of San Pablo and Suisun), where it becomes low and barren and is known as the Benicia Hills. A branch of the Russian River originates on the western side of Mt. St. Helena, and, joining the main stream, its waters, running in a westwardly direction, reach the Pacific Ocean. Another stream, Putah Creek, the Rio de los Putos of the Spanish Californians, has its beginnings in the cañons on the eastern slope of the mountain, and this winds eastward for some seventy or eighty miles, cutting straight through the bold western face of the Inner Coast Range and eventually joining the Sacramento River.

Notwithstanding its height this mountain is not easily distinguished at a distance, by reason of being flanked by prominent ridges, but its regularly-sloping notched summit and abrupt sides continually engage the attention and interest of the traveler journeying through the broken Coast Range country north of the bay of San Francisco.

From whatever mountain-ridge or favored valley one may have the advantage of view, its outline against the sky is almost as constant as is that of a conical peak. This is due to the subquadrilateral arrangement of the prominent shoulders of the mountain. The summit is made up of three main ridges. The first of these lies in a northeasterly and southwesterly direction, and is composed of two rounded knobs connected by a low divide. The

Contributions from the Botanical Laboratories of the University of California, No. 6.

longer second ridge lies parallel to this: its northeastern extremity ends in cliffs; its southwestern extremity is less abrupt, the ultimate termination being a lateral spur lying in nearly the same direction. The short sharp third ridge lies at nearly right angles to the second; its highest point is the highest point of the mountain, and on it are located the piers of the signal station of the United States Coast and Geodetic Survey.

The entire summit and the abrupt sides above 2,300 or 2,400 feet are covered with a sheet of volcanic ash, mostly in the form of loose somewhat finely broken rock. There is nothing that can be called soil above 3,000 feet, and there is no spring on or near the trail from 2,300 feet up to the signal station piers. Indeed, so far as my knowledge extends, water can not be found anywhere above the altitude just named.

On account of its volcanic character and the scarcity of water, the number of species to be found on the summit is very small. Meager as the vegetation is in number of species, yet, doubtless, the number of species would be even less were the mountain located in the Inner, instead of the Middle, Coast Ranges. Its situation is in a region of great annual rainfall, and the fogs hang about the mountain at intervals during the rainless season for a portion of the day for a period of several days to a week or more.

The general conditions may be compared with those of Mt. Diablo, which lies to the southeastward of Mt. St. Helena and distant sixty-seven miles from it. The number of species on the summit of Diablo, taking the list* of Prof. Greene as a basis, is over four times as great as the number enumerated below from St. Helena, notwithstanding that the former region is one of less annual rainfall and that summer fogs seldom reach as far inland as Mt. Diablo, and in such cases the summit is commonly enveloped but for a few hours.

The difference in the humidity of the two regions is readily to be inferred by the traveler. Fertile valleys and low hills lie about the western bases of both mountains, but it is noticeable that those near Mt. St. Helena possess a much more prolific and rich (and more characteristically coast) vegetation than the valleys and low hills

* ERYTHEA, I, 166, a catalogue of 156 species.

ARCTOSTAPHYLOS STANFORDIANA Parry.

ERYTHEA, VOL. VII,
PLATE III.

about Mt. Diablo; especially is this obvious in the long, dry, rainless season.

But when we ascend each of these mountains we find the soil conditions very dissimilar, the sides of Mt. Diablo being covered with fairly fertile soil quite to the summit. This factor then must account primarily for the striking differences in the character of the vegetation. The herbaceous vegetation of the summit of Mt. Diablo is in general rich both as to number of species and individuals, while St. Helena is defective in both of these particulars. Shrubs as to individuals abound on both mountains but the former mountain has the advantage in number of species. The shrubs of Mt. Diablo are invariably those species characteristic of the dry interior ridges.

Notwithstanding the arid character of the summit of Mt. St. Helena, it possesses a few species characteristic of the humid Coast region or of the High Sierras and other elevated mountain ranges, such as the Douglas Spruce (Pseudotsuga taxifolia), and the Flowering Dogwood (Cornus Nuttallii); although the latter can scarcely be said to belong to the summit of the mountain, it ascends to points above the beginnings of the volcanic ash. Three species of Ceanothus, C. velutinus var. lævigatus, C. prostratus, var. divergens, and C. foliosus, all found on Mt. St. Helena, are not found in the Inner North Coast Ranges nor yet on Mt. Diablo. Otherwise the species are almost entirely those characteristic of the more arid districts of California.

The vegetation of the summit is distinguished by the prevalence of shrubs of a limited number of species which completely mantle the shoulders and enwrap the sides of the mountain above 2,300 to 2,500 feet. *Arctostaphylos manzanita* is very abundant, particularly at the highest elevations, and numerically outranks all other species. *Garrya Fremonti* is fairly common, and *Xylothermia montana*, *Rhamnus Californica* and *Ceanothus foliosus* are very frequently met with. A fine thicket of *Castanea chrysophylla* is to be found on the ascent to the second summit. Two species of oak, *Quercus chrysolepis* and *Wislizenii*, are represented by scattered individuals.

Two other low shrubs, neither of them abundant, were found, viz., *Dendromecon rigidium* and *Eriodictyon Californicum*. The only trees were two species of Coniferæ. *Pinus attenuata* is scattered

more or less all over the mountain, and there is quite an abundant young growth four to eight feet high, on the lateral spur of the second ridge spoken of above. On the southern face of the mountain are many fallen trunks denuded of bark, but with as many as fifteen and eighteen whorls of persistent cones. *Pseudotsuga taxifolia* grows plentifully on the northeastern side of the mountain, especially about the cliffs in that neighborhood. Trees fifty to sixty feet high grow not far from the highest summit. *Razoumofskya occidentalis* was discovered on *Pinus attenuata* on the first summit.

There was a conspicuous lack of herbaceous species above 3,000 feet and not a sign of an annual. Of herbaceous perennials exclusive of parasitic forms, there were found only Hypericum concinnum, Pedicularis densiflora, Monardella odoratissima and Zygadenus Fremonti. The total number of species collected above 3,000 feet was twenty-one. They were in no sense peculiar, all being common inhabitants of the Coast Range Mountains. These plants, both of shrubs and herbaceous perennials, are, however, those species which have been most successful in developing adaptations to the very arid and gravel-covered areas of the high Coast Range ridges.

The edges of the volcanic sheet yielded by far more plants of interest than the broad summits of the mountain. Above 2,400 and up to 3,000 feet were found the greater number of species given in the list. This zone extends from the upper limit of the Kellogg Black Oak, as trees, to the upper limit of *Ceanothus foliosus*, which is about 2,800 to 3,000 feet. In this area were found a number of species sufficient to extend considerably the list of plants of the summit. But even the plants collected here were not remarkable as yielding the rare or peculiar species of the summits of Mt. Diablo, Mt. Hamilton, and other peaks south of the bay of San Francisco. The rarities collected here were of an entirely different character. It was soon evident that close search would reveal the recurrence on the edges of the volcanic sheet of a significant number of plants of only a few known stations belonging to the highest summits of the Coast Range ridges and peaks north of the bay of San Francisco. The rare Campanula augustiflora, Eastwood, collected on the mountain by Mrs. Brandegee, has been found elsewhere but on Mt. Tamalpais. *Pentstemon Sonomensis*,

regarded as local on Hood's Peak, was found at the base of projecting rocky masses near the trail at about 2,600 feet. *Antirrhinum virga*, also on Hood's Peak, and collected on Uncle Sam Mountain and on Howell Mountain by the writer, was found with the preceding. *Lupinus sericatus*, first collected on Cobb Mountain, ten miles north, was quite abundant at 2,400 feet. A local form of *Adenostegia Pringlei*, which is at home on the higher Coast Ranges northward, is described below. The only southern plants appearing here that I regard as worthy of note are as follows: *Peucedanum Hassei*, first collected near Los Angeles and later on the Vaca Mts. by the writer, and *Bigelovia arborescens*, common on Mt. Tamalpais, and other more southerly mountain summits and ridges. *Ceanothus foliaceus*, peculiar to the neighboring mountain country bounding Napa Valley and southwestward to Mt. Tamalpais, was quite abundant. Lastly there is to be noted *Arctostaphylos Stanfordiana*, peculiar to the Mayacamas Range from Howell Mountain northward to Cobb Mountain. While the number of local species is thus small, it is likewise true that the number is not so insignificant when compared with the total number of plants recorded.

The flanking spurs and ridges upon which the main mountain mass rests are very nearly of the same height on the several sides of the mountain, and the volcanic rock extends well down to these lower fertile slopes. The grade of the Clear Lake road passes over the southeastern flanking ridge at the very base of the abrupt upper mountainside. This divide is 2,300 feet in height. About 100 feet above this the volcanic rock is very evident, trees disappear, and there is nothing larger than brushwood. No plants below 2,400 feet were recorded, which is about the upper limit of all trees except pines. Between 2,400 and 4,343 feet the altitudes given are only approximate.

The first explorer to reach the summit of Mt. St. Helena was the Russian botanist, Wossenessky, and his companion, Tschnerich, who formally named the mountain in honor of the Russian empress on the date of the visit, June 12, 1841. I find no record of any plants collected by them on or near the mountain. The writer has visited the summit on three occasions: first on May 4, 1893; again

on September 23, in the same year; and lastly on July 19, 1894. These were the most favorable dates (considering the altitude) on which one would expect to find in best condition the vernal and late æstival plants.

LIST OF SPECIES COLLECTED ABOVE 2,400 FEET ALTITUDE.

1. DENDROMECON RIGIDUM Benth. Not infrequent over the entire mountain.

2. UMBELLULARIA CALIFORNICA (Arnott) Nutt. Reaching as high as 2,400 feet in the ravines.

3. ERYSIMUM ASPERUM DC. Occasional through the more open brushwood.

4. VIOLA LOBATA Benth. Lower slopes.

5. HELIANTHEMUM SCOPARIUM Benth. The most common herbaceous plant on the very highest shoulders.

6. HYPERICUM CONCINNUM Benth.

7. RHUS DIVERSILOBA T. & G. Infrequent.

8. RHAMNUS CALIFORNICA Esch. Fairly frequent. Several shapely although not large specimens of this shrub noticed on the first summit.

9. CEANOTHUS FOLIOSUS Parry. Common on the lower southern face of the mountain. Only a few individuals noticed above 3,500 feet.

10. CEANOTHUS PROSTRATUS Benth., var. DIVERGENS Trelease. C. divergens Parry. Common on the southern face.

11. CEANOTHUS VELUTINUS Dougl., var. lævigatus T. & G. Only a few shrubs seen, and but one individual discovered above 3,000 feet. The southernmost station in the Coast Ranges.

12. LUPINUS SERICATUS Kellogg.

13. PICKERINGIA MONTANA Nutt.

14. ADENOSTEMMA FASCICULATUM H. & A. Abundant on the southern face.

15. PEUCEDANUM HASSEI C. & R. The northern limit of an extreme southern plant.

16. GARRYA FREMONTI Torr. On the higher summits.

17. Razoumofskya occidentalis O. Ktze. Parasitic on *Pinus attenuata* Lemmon.

18. Lonicera interrupta Benth.

19. Bigelovia arborescens Gray. Only one or two plants noticed. The most northerly station recorded.

20. Helianthella Californica Gray.

21. Senecio aronicoides DC.

22. Campanula augustiflora Eastwood.

23. Arctostaphylos manzanita Parry.

24. Arctostaphylos Stanfordiana Parry. Unlike *A. manzanita* (which ranges altitudinally from valley-levels to the highest Coast-Range ridges), this species is only found at considerable elevations in the mountains, on plateaus, or on more or less flat summits or broad slopes. The mountaineer recognizes each of these shrubs, without hesitation: the foliage of *A. manzanita* is of a grayish or dull green; the foliage of *A. Stanfordiana* is of a vivid green. The former shrub (which in this region is often 12 or 14 feet high) often looks ragged or unkempt; the latter is exceedingly trim and neat, and one rarely finds an imperfect or insect-eaten leaf. Its height is commonly about $3\frac{1}{2}$ or 4 feet.

The botanical traveler, however, is at once interested in a striking unlikeness between the two shrubs, an unlikeness which does not originate from a mere difference in the hue of the foliage, but is of a sort more tangible and, in this case, more impressive. While the leaves of *A. manzanita* are said to be vertical, many leaves on a shrub are not vertical, and as many as one-half the leaves on a twig may not stand in a vertical position, but very nearly all the leaves on a shrub of *A. Stanfordiana* are quite vertical. This is a feature of the shrub which appeals to the eye, and is quite well shown in the plate (Pl. III), which accompanies this article.

These differences in habit have not, hitherto, been described, and to these vegetative differences may now be added certain differences in the flowers of the two species. The flowers of *A. manzanita* are commonly white, about four lines long, with the calyx quite as broad as the base of the urn-shaped corolla. The flowers of *A.*

Stanfordiana, on the contrary, are pink in color, about three lines long, with the calyx only one-half the diameter of the corolla, and with the base of the latter depressed about the edge of the calyx, and more or less concealing it. The corolla possesses a slight constriction below the middle, although in some cases this structure is not clearly evident.

ARCTOSTAPHYLOS, abnormal form. A single shrub about two feet high, near the highest point of the mountain; leaves orbicular, broader than long, subcordate at base, retuse at apex, and densely crowded on the branchlets, in some cases appearing like rosettes.

25. ADENOSTEGIA PRINGLEI (Gray) Greene. Annual; collected in flower, the plants 10 to 18 inches high and nearly or quite leafless; stems and branches very rigid and brittle, of a reddish or mahogany color. Although this is named with certainty, the vegetative adaptation of the plants to the sun-scorched lava-flow lent to these individuals so strange an aspect that I took them to be of a new species when first seen in the field.

26. ERIODICTYON CALIFORNICUM Greene.

27. BOSCHNIAKIA STROBILACEA Gray. First summit, parasitic on roots of Arctostaphylos manzanita.

28. MONARDELLA ODORATISSIMA Benth. Indifferently typical.

29. QUERCUS CHRYSOLEPIS Liebm. In a shrubby form on the various summits.

30. QUERCUS WISLIZENII A. DC. Reduced and shrub-like.

31. QUERCUS KELLOGGII Newb. Within the limits only as a shrub two or three feet high.

32. QUERCUS DENSIFLORA H. & A. Barely within the limits.

33. CASTANEA CHRYSOPHYLLA Dougl.

34. ZYGADENUS FREMONTI Torr. Plants past fruiting and nearly gone.

35. PSEUDOTSUGA TAXIFOLIA (Lambert) Britton.

36. PINUS ATTENUATA Lemmon.

A considerable number of species was collected between 2,300

and 2,400 feet altitude, that could not properly be included in the above list. A few of these are as follows: Eriogonum nudum Dougl.; Euphorbia leptocera Engelm.; Ranunculus occidentalis Nutt., var. Rattani Gray; Lupinus latifolius Agardh., quite common; Fragaria Californica C. & S.; Whipplea modesta Torr.; Epilobium minutum Lindl.; Galium Nuttallii Gray; Valerianella congesta Lindl.; Wyethia augustifolia (DC) Nutt; Helianthella Californica Gray; Hieracium albiflorum Hook.; Sanicula Menziesii H. & A.; Myrrhis occidentalis B. & H., Arbutus Menziesii Pursh; Gilia achillæafolia Benth; Quercus Douglasii H. & A., almost within the limits; Pinus ponderosa Dougl., trees 100 feet high or over at 2,300 feet altitude.

Two parasites, Pyrola aphylla Smith and Corallorhiza Bigelovii Wats., for which few stations are known in the Bay Region, were collected under trees between 2,300 and 2,400 feet altitude.

On a miniature-plateau at the foot of the trail up the mountain-side proper, and not far from the summit of the Clear Lake wagon-grade, are several shapely Madrone (Arbutus Menziesii) and Black Oak (Quercus Kelloggii) trees 40 to 50 feet high, and with girth of 5 to 7 feet.

NEWS NOTES AND CURRENT COMMENT.

Fertilizers: the source, character and composition of natural, home-made, and manufactured fertilizers, and suggestions as to their use for different crops and conditions, a new volume of the Rural Science Series, by E. B. Voorhees, of the New Jersey Experiment Station. [MacMillan & Co., New York, $1.00.]

Prof. Dr. Paul Knuth, of Kiel, Germany, arrived in California from Java on May 29 last. He remained in California the greater part of two months, studying here as in other countries visited on his journey around the world, the relation of animals and flowers. He is the author of a well-known treatise on "Bluthen-biologie."

According to the daily newspapers twoscore scientists, constituting the Harriman Exploring Expedition to Alaska, left

Seattle, May 31, on the steamer *Elder*, for a two-months cruise in Alaskan waters. There is much public interest in this expedition on account of the many well-known scientific men composing the party, and perhaps not less on account of the fact that all of the members of the expedition are guests of Mr. E. H. Harriman, a New York banker. The following is a partial list of the natural-history men: W. H. Brewer, Yale University; John Burroughs, West Park, New York; John Muir, Martinez, California; Dr. C. Hart, Merrian, chief of the U. S. Biological Survey; Charles Keeler, California Academy of Sciences; F. V. Coville, Chief of the Division of Botany, Washington, D. C.; Benj. K. Emerson, Professor of Geology, Amherst College; Prof. B. E. Fernow, College of Forestry, Cornell University; Dr. A. K. Fisher, U. S. Biological Survey; Dr. George Bird Grinnell, Editor of *Forest and Stream*, New York; Dr. Charles Palache, Harvard University; De Alton Saunders, Botanist to the South Dakota Experiment Station; Prof. W. E. Ritter, Department of Zoology, University of California; Dr. Wm. Trelease, Director of the Missouri Botanical Garden; Robert Ridgway, National Museum, Washington, D. C.; T. H. Kearney Jr., Assistant Botanist, Department of Agriculture, Washington, D. C.; C. K. Gilbert, Geologist, U. S. Geological Survey.

Mr. Martin W. Gorman, of Portland, Oregon, who has traveled and botanized in Alaska for many years, left Fort Selkirk last July with a party of four on an expedition across country to the upper waters of White River. In the latter part of August, Mr. Gorman in attempting to descend the White River to the Yukon on a raft with an ill companion was wrecked at the confluence of the two streams, on September 1. Mr. Gorman's companion was drowned, but he, after being in the water for four and one-half hours, was opportunely rescued, by some passing hunters. His provisions had previously become exhausted, and for several days the daily subsistence had consisted of a few spoonfuls of flour boiled in water. All of his botanical specimens were destroyed, and, quite worn out, he arrived at Dawson, September 7, whence he writes that he will return to Portland soon, and adds feelingly that he "has had enough of the land of more square miles than square meals for the present."

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NORTHWESTERN PLANTS, CHIEFLY FROM OREGON.

By J. M. Greenman.

Mr. William C. Cusick, who for a number of years has devoted considerable attention to the flora of Oregon, particularly Union County, has made during the past season an extensive collection of plants in the southeastern portion of the state. Some of the more interesting localities visited were the Wallowa Mountains, the southern Blue Mountains, Stein's Mountains, Alvord Desert, and the region of the Malheur. The collection is particularly noteworthy in containing, in addition to certain species new to science, a number of specimens which extend materially the geographical range of several species hitherto known only from the dry regions of northwestern Utah, from northern Nevada, and from the mountains of California. Descriptions of the newly characterized species and brief notes on the extension of ranges are given below.

Alisma californicum, Torr. Pacific R. Rep. iv. t. 21 (1857); Bolander, Cat. 29, name only (1870); Wats. Bot. Calif. ii. 200, in syn. (1880); Micheli in A. DC. Monogr. Phan. iii. 34 (1881); Buchenau in Engler, Jahrb. ii. 480 (1882), & in Engl. & Prantl, Nat. Pflanzenf. ii. Ab. 1, 230 (1889). *Damasonium californicum*, Torr. in Benth. Pl. Hartw. 341 (1857), & Pacific R. Rep. iv. 142 (1857); Watson, Bot. Calif. ii. 200. Excellent flowering and fruiting specimens of this interesting species were collected by *William C. Cusick* in a pond at the foot of Stein's Mountains near Divine Creek, Oregon, 3 July, 1898, no. 1997. The species seems hitherto to have been known only from California.

Eriogonum ochrocephalum, Watson, Bot. Calif. ii. 480. Excellent specimens, agreeing well with the type of this species, were collected by *William C. Cusick* on "Chalk" hillsides of southeastern Oregon, 15 June, 1898, no. 1930. The occurrence of the species seems not to have been hitherto reported from other than its original locality in northwestern Nevada.

Ranunculus juniperinus, Jones, Proc. Calif. Acad. Sci. ser. 2, v. 616; Gray, Syn. Fl. i. pt. 1, 463. Specimens agreeing well with

authentic material of this species were collected by *William C. Cusick* at the head of Otis Creek, southern Blue Mountains, Oregon, 15 July, 1898, no. 1828. The species has been hitherto known only from Utah.

Spiræa discolor, Pursh, var. **glabrescens.** *S. discolor*, Pursh, var. *dumosa*, Watson, Bot. Calif. i. 170, in part. *S. dumosa*, Torr. in Stansbury, Rep. 387, t. 4 (as to Stansbury's plant and illustration). A diffuse shrub 6 to 12 cm. high, closely resembling *S. discolor*, var. *dumosa*, Wats., but having leaves only sparingly pubescent with soft hairs on either surface and glandular-dotted especially beneath, not silvery-tomentose beneath as is the case with var. *dumosa*.—Oregon, Stein's Mountains, *Cusick*, June, 1885, no. 1253, and in 1898, no. 1968; Crater Lake, 15 September, 1896, *E. I. Applegate*, no. 172; California, Mt. Shasta, altitude 2,400 to 2,800 m., *Brewer*, no. 1388; Utah, Great Salt Lake, *Stansbury*. Specimens collected by Dr. Watson in E. Humboldt Mountains, Nevada, altitude 2,100 m., July, 1868, no. 305 (in part), are somewhat intermediate between *S. discolor*, var. *dumosa*, and *S. discolor*, var. *glabescens*.

Potentilla Breweri, Watson, var. expansa, Watson, Bot. Calif. i. 179. This variety formerly known from California and Nevada is well represented by specimens collected by *William C. Cusick* along streams at the head of Wild-horse Creek, Stein's Mountains, southeastern Oregon, 15 July, 1898, no. 2037[a].

Oxytropis Cusickii. Subacaulescent cespitose-depressed herbaceous plant from a deep perennial root: leaves including the petiole 4 to 8 cm. long, impari-pinnate, subappressed-villous-sericeous; leaflets 7 to 19, opposite or subopposite, oblong-lanceolate, 4 to 10 mm. long, 1.5 to 3 mm. broad, acute, margins more or less involute; stipules scarious, 3-nerved, sparingly villous-pubescent on the outer surface, long-ciliate especially along the margins of the triangular-lanceolate free portion: scape during anthesis about equal to or somewhat exceeding the leaves, later becoming elongated and nearly or quite twice exceeding the foliage; peduncle appressed-sericeous-villous; bracts lance-ovate to lance-linear, 4 to 8 mm. long, obtusish: flowers sessile, later becoming short-pedicellate: calyx 7 to 9 mm. long, appressed-canescent-villous with shorter blackish appressed hairs intermixed, the lobes small, scarcely 2

mm. in length by 1 mm. broad, the two outer or lower slightly shorter and broader: corolla white; standard about 15 mm. long, unguiculate, oblong-obovate, deeply emarginate; wings somewhat two-lobed above: legume cylindrical, 1.5 to 2 cm. long, firm in texture, externally appressed-canescent-pubescent with dark hairs intermixed, distinctly 2-celled, especially below; stipe short but distinct. Collected by *W. C. Cusick*, on the alpine summits of the Wallowa Mountains, E. Oregon, 1891, no. 1365, and 23 August, 1898, no. 2095. A species having the general habit of *O. Parryi*, and *O. oreophila*, Gray, but readily distinguished from the former by the more numerously flowered scape, the less obovate rotund and more strongly emarginate standard, and usually larger seeds, and from the latter by the longer flowers and larger and firmer 2-celled legume.

EMMENANTHE PUSILLA, Gray, Proc. Am. Acad. xi. 87, Bot. Calif. i. 515, & Syn. Fl. ii. pt. 1. 171. This species hitherto recorded from Nevada only, through the collections of *Lemmon* and *Watson*, is also well represented by specimens collected by *William C. Cusick* in alkaline soil, Union County, Oregon, no. 758 (coll. 1879) and by specimens secured by the same collector on the Malheur, 20 June, 1898, no. 1946.

Conanthus parviflorus. Low depressed annual, branching from the base, covered throughout with a scattered spreading coarse hirsute pubescence: branches repeatedly dichotomous, prostrate or ascending, 2 to 15 cm. long: leaves spatulate-linear or narrowly oblanceolate, 1.5 to 2 cm. long, 2 to 5 mm. broad, acute or obtuse, with a rather prominent midrib beneath: flowers sessile, solitary in the axils: calyx deeply 5-parted; lobes lance-linear, 3 to 4 mm. long, hirsute-hispid with long spreading hairs: corolla purplish or light blue, soon fading, tubular, less than 5 mm. in length, barely exceeding the calyx: style about 1 mm. long united to near the top, stigmas capitate: capsule oblong, 2.5 mm. long, hirsute-pubescent above, about 15-seeded. A species of the dry sandy plains of the northwest: Oregon in sandy soil of the Malheur, 21 June, 1898, *William C. Cusick*, no. 1957, and in the same region, collection of 1885, no. 1231, on sage plains, 16 June, 1885, *Thomas Howell*, no. 492; Washington, near Wallula, June, 1883, *T. S. Brandegee*, no. 978, near Morgan's Ferry, Yakima River, 8 June, 1884, *W. N.*

Suksdorf, no. 399; Nevada, *A. Gray* (coll. of 1872), near Belleville, *W. H. Schockley*, no. 340 (coll. of 1880), and at Candelaria, no. 382 (coll. of 1886). This species has hitherto been confused with *C. aretioides*, Watson, but may be distinguished readily from it by the very marked difference in the size of the flowers.

Plagiobothrys hispidus, Gray, Proc. Am. Acad. xx. 286, & Syn. Fl. ii. pt. 1, 432. *Sonnea hispida*, Greene, Pittonia, i. 22. Specimens collected by *William C. Cusick* on dry steep sides of Stein's Mountains, southeastern Oregon, 28 June, 1898, no. 1970_a, but for the slightly larger and somewhat less papillose-granulate nutlets, agree in all details with the type specimen of the above species. The collection of Mr. Cusick extends the range of the species considerably northward.

Krynitzkia micrantha, Gray, Proc. Am. Acad. xx. 275, & Syn. Fl. ii. pt. 1, 428. *Eritrichium micranthum*, Torr. Bot. Mex. Bound. 141; Watson, Bot. King Exp. 244; Gray, Syn. Fl. ii. pt. 1, 193. Fruiting specimens corresponding in every detail with this species were collected by *William C. Cusick* on the sands of Alvord Desert, southeastern Oregon, 7 July, 1898, no. 2020^a. The occurrence of this species in Oregon extends its range considerably north of any station hitherto recorded.

Krynitzkia mollis, Gray, Proc. Am. Acad. xx. 264, & Syn. Fl. ii. pt. 1, 424. *Eritrichium molle*, Gray, Proc. Am. Acad. xix. 89. Specimens belonging to this characteristic and readily recognized species were collected by *William C. Cusick* in moist alkaline situations, Harvey Valley, Oregon, 18 July, 1898, no. 2045.

Mertensia umbratilis. An erect herbaceous perennial, 3 to 4.5 dm. high: stems 1 to 5 from the base, smooth and glabrous: basal leaves elliptic-oblong to oblong-ovate, the blade 6 to 12 cm. long, 2.5 to 4 cm. broad, obtuse at the apex, entire, narrowed below into a long winged petiole; the upper stem-leaves sessile, lanceolate, oblong-lanceolate to ovate, 5 to 12 cm. long, 1.5 to 3 cm. broad, acute, glabrous upon either surface or inconspicuously appressed-tuberculate-hispid above, more or less punctuate, margins hispidulous with appressed hairs: inflorescence terminating the stems, rather few-flowered, paniculate, usually nodding even in the fruiting stages; pedicels usually longer than the calyx: calyx 5 to 8 mm. long, deeply 5-lobed; lobes lanceolate, acute, margins more or less

appressed-ciliate: corolla blue, 1.6 to 1.8 cm. long: mature nutlets whitish, about 3.5 mm. long, their surfaces somewhat corrugated. Collected by *William C. Cusick* on dry mountains near Sparta, Union County, Oregon, 25 May, and 3 June, 1898, no. 1886, also in the same locality, no. 856 (coll. of 1880). "Commonly growing in the shade of small shrubs," hence the specific name. *M. umbratilis* is closely related, as shown by the foliar characters, to *M. sibirica*, Don, but differs conspicuously from it in the longer lanceolate acute calyx-lobes, the larger corolla, and in the somewhat larger fruit.

Lophanthus Cusickii. Low much-branched suffrutescent herbaceous perennial, 1.5 to 3 dm. high, covered throughout with a short close evenly spreading pubescence: leaves ovate or triangular-ovate, 1 to 2 cm. long, about two-thirds as broad, unequally crenate-serrate, obtuse or acutish, narrowed below into a petiole; petioles equaling or shorter than the blade: the congested terminal spikes often nodding at least in the earlier stages: calyx-teeth narrowly lanceolate, attenuate, purplish. Collected by *William C. Cusick* on dry mountain-sides of Stein's Mountains, southeastern Oregon, 4 July, 1898, no. 2001. This species is most nearly related to *L. urticifolius*, Benth., from which, however, it is distinguished by its lower more branching habit, smaller usually cuneate leaves, more evident pubescence, and by the longer and more attenuate calyx-teeth.

Mimulus (Eunanus) clivicola. Low herbaceous annual, 2 to 15 cm. high, glandular pubescent throughout: stems simple or branched from the base: leaves oblong-ovate to oblanceolate, 0.5 to 2 cm. long, a third to one-half as broad, 3-nerved, entire or more commonly somewhat toothed toward the obtuse apex, more or less glandular-pubescent upon either surface: flowers axillary: pedicels 0.5 to 1.5 cm. in length: calyx 6 to 10 mm. long, about equally 5-toothed; teeth ovate, acute, 2 mm. long: corolla pale-purple or yellowish, often spotted at the throat, narrowly funnel-form, 1.2 to 2 cm. in length, evidently bilabiate, pubescent in the throat, the lobes bearing a few scattered hairs on their upper or inner surface: capsule linear-oblong, somewhat attenuate and curved above, slightly overtopping the persistent calyx. Idaho,

slopes near the foot of Weissner's Peak, Kootenai County, 8 July, 1892, *Sandberg, MacDougal, & Heller*, no. 586, on dry hillsides of Cedar Mountains, Latah County, 7 July, 1893, *Piper* no. 1657, and near South Clearwater, 26 June, 1894, *Henderson*, no. 2677; Oregon, on hillsides of Pine Creek, Union County, 25 May, 1898, *Cusick*, no. 1891.

CORDYLANTHUS CANESCENS, Gray, Proc. Am. Acad. vii. 383, Bot. Calif. i. 581, & Syn. Fl. ii. pt. 1, 304. Specimens agreeing in all essential details with this species were collected by *William C. Cusick* near hot alkaline springs, Alvord Valley, southeastern Oregon, 14 July, 1898, no. 2034. The occurrence of this plant at the above station extends the range of the species considerably northward from its hitherto recorded localities.

TOWNSENDIA WATSONI, Gray, Proc. Am. Acad. xvi. 84, & Syn. Fl. i. pt. 2, 168. Specimens collected by *William C. Cusick* in the Malheur region of southeastern Oregon, 17 June, 1898, no. 1935, agree in all essential characters, particularly in the very short pappus of the ray-flowers, with the type specimen of the above species. Here also may be referred Cusick's no. 1267 (coll. of 1885) from the same region. Although the pappus of the ray-flowers in the last cited number is somewhat variable, yet the setiform squamellæ rarely exceed in length the diameter of the achene, thus showing its affinity with *T. Watsoni* rather than with *T. scapigera*, to which species it has been previously referred.

HELENIUM HOOPESII, Gray, Proc. Acad. Philad. 1863, p. 65, Bot. Calif. i. 392, & Syn. Fl. i. pt. 2, 347; Dod in Garden xxix. 191. Excellent specimens of this characteristic species were collected by *William C. Cusick* along streams of the higher Stein's Mountains, southeastern Oregon, 15 July, 1898, no. 2037. Although this species has a comparatively wide distribution, it does not seem to have been hitherto recorded definitely from Oregon.

STEPHANOMERIA PENTACHAETA, Eaton in Wats. Bot. King Exp. 199, t. 20, f. 8–10; Gray, Proc. Am. Acad. xix. 63, & Syn. Fl. i. pt. 2, 414. To this species may be referred specimens collected by *William C. Cusick* on Alvord Desert, southeastern Oregon, 7 July, 1898, no. 2019. The species has been heretofore attributed only to Nevada and California.

Gray Herbarium,
Harvard University.

THREE NEW WESTERN PLANTS.

By M. L. Fernald.

Carex Blankinshipii. Culm slender, nearly 1 m. high, smooth or slightly roughish above: leaves 0.5 cm. broad, rather short, with the sheaths pubescent: staminate spike broadly clavate, 1.5 cm. long, short-stalked or subsessile; pistillate spikes 3 or 4, 2 cm. or less in length, short-stalked or subsessile, subtended by very short lance-subulate bracts, approximate at the tip of the culm or the lower rarely remote: perigynium hirsute, triquetrous, elliptic-lanceolate, tapering gradually to the truncate slightly bifid beak, obscurely about 10-nerved; stigmas 3: the purplish or brown scale orbicular or ovate, ciliate, the midrib generally continued into a rough awn, hardly equaling the perigynium.—Hydesville, Humboldt County, California, June 19, 1893 (*J. W. Blankinship*). Nearest related to *C. hirtissima*, W. Boott. That species, however, is lower, with longer-stalked scattered spikes, shorter more abruptly beaked perigynia with finer pubescence, and thinner paler and smoother scales. The pubescence of the perigynia of *C. Blankinshipii* is like that of *C. yosemitana*, Bailey, and in habit the plant suggests *C. gynodynama*, Olney, but that is a lower plant with smooth leaves and broader perigynia.

Amelanchier Cusickii. A shrub 2 or 3 m. high, with slender, flexible branches, the smooth bark reddish brown: winter buds reddish, the outer scales glabrous, the inner bearded within: leaves pale green, firm, becoming coriaceous, about 3 cm. long, on petioles 1 or 2 cm. long, from ovate-oblong to obovate-oblong, glabrous from the first, the younger acute, the older becoming rounded at the tip, serrate with salient teeth nearly or quite to the base, or entire below, the upper teeth most prominent: racemes about 6-flowered, the pedicels glabrous: calyx glabrous without, the lance-acuminate sepals pubescent within: petals oblanceolate, 2 cm. long: top of ovary glabrous; pome 1 cm. in diameter, scarlet, tardily turning black.—On stony hillsides, Union County, Oregon, May 5, and June, 1898 (*W. C. Cusick*, No. 1858). Related to *A. alnifolia*, Nutt., and *A. pallida*, Greene, but differing from the former in its strictly glabrous young foliage and racemes, the much longer petals, the more serrate leaves, the different flowering season, and in the

tardy darkening of the fruit, which, according to Mr. Cusick, remains scarlet after the seeds have become dark. From *A. pallida* it is distinguished by its more serrate leaves, larger flowers and reddish bark.

Castilleia Dixonii. Stems many from a branching caudex, much depressed, decumbent or slightly ascending, mostly 2 or 3 cm. long, somewhat angled, glabrous below, pilose in the inflorescence: leaves lanceolate or linear-lanceolate, entire, very thick and leathery, 3-nerved, smooth or slightly puberulent, or sometimes scabrous on the margins, 1.5 to 5 cm. long: bracts red, pilose, mostly entire, or with 2 or 4 narrow divisions near the tip: calyx 2.5 cm. long, mostly exceeding the bracts, subequally cleft before and behind, the divisions lanceolate, acute: corolla about 3 cm. long, the exserted galea slightly shorter than the tube: lip 2 mm. or less long, with three oblong-ovate teeth.—Abundant on the seashore, in gravelly or sandy soil, usually just above high-water mark, Quinaitt Indian Agency, Washington, July 17, 1898, collected by *Roland B. Dixon*, during an anthropological expedition on the northwest coast. Formerly collected at Gray's Harbor, Puget Sound, by the Wilkes Exploring Expedition. Nearest related to *C. miniata*, Dougl., but differing strikingly in its depressed habit and very leathery leaves. The galea, too, is shorter than is general in that plant.

Gray Herbarium,
Harvard University.

TERATOLOGY OF SCROPHULARIA CALIFORNICA.

By Willis L. Jepson.

Abnormal individuals among plants in a state of nature, as is well known, are comparatively infrequent. They are, indeed, exceedingly rare when compared with the total number of normal plants of the species, and teratological flowers or fruits are in most cases solitary on the individual. Rarely does it occur that the examples are numerous. In the case about to be described, however, the abnormal flowers observed were found in great numbers, there being dozens of plants and tens of thousands of flowers. Moreover, this species, *Scrophularia Californica* Cham., occurs in the same spot year after year, and continues to develop in its season monstrous inflorescences.

The exact locality where these plants were observed, is a little shelf on the hillside in the rear of the buildings of the University of California. They occupy (almost exclusive of other species) a space fifty by twenty yards and grow three to six feet in height. A great many of the individuals growing here are perfect, but mixed in with them are the ones to be considered.

In the seasons of 1895, 1896, 1897, and 1898, abnormal plants abounded. In the season of 1898 doubtless one-fourth the individuals came under this category.

The inflorescence, as is well known, is a more or less pyramidal panicle, which is, when produced by thrifty plants, one to two feet long. In some cases all the flowers of the panicle were replaced by leafy branches. In other cases all the flowers were abnormal but none of the parts had become foliaceous or scarcely so. Then, again, there were inflorescences in which but a few flowers were abnormal, and many in which abnormal flowers and flowers changed into leafy shoots were intermixed.

A typical abnormal flower may be described as follows: Calyx chorisepalous with linear or obovate lobes—Fig. 3, s—(instead of synsepalous with ovate lobes as in the normal flower); corolla regular or nearly so—Fig. 3, c—(the normal corolla is bilabiate with the upper lip erect and much longer than the lower, the middle of which

Contributions from the Botanical Laboratories of the University of California, No. 8.

is deflexed—see Fig. 1); the stamens do not, in any instance, "revert" but the anthers are nearly always abortive (in the normal flower the stamens are four, with a sterile filament on the upper side of the corolla and almost completely united with the tube); pistil becoming obovoid or sometimes clavate and apparently stipitate, much protruded, finally rupturing at the top of each cell and allowing the cluster of little leaves which occupy the place of the ovules to escape from the fissure (the normal fruit is an ovate 2-celled capsule with many seeds borne on axile placentæ). Just as frequently, however, the upper portion of the placentæ is crowded with sterile ovules with long funiculi (Fig. 6, p = placentæ; o = ovules); these do not develop further and in consequence the wall of the ovary remains intact.

While such a general account covers most of the flowers examined, there are, indeed, an almost indefinite number of departures from the normal form. Some of these variations are, however, so suggestive or pronounced in structure that they are here separately described.

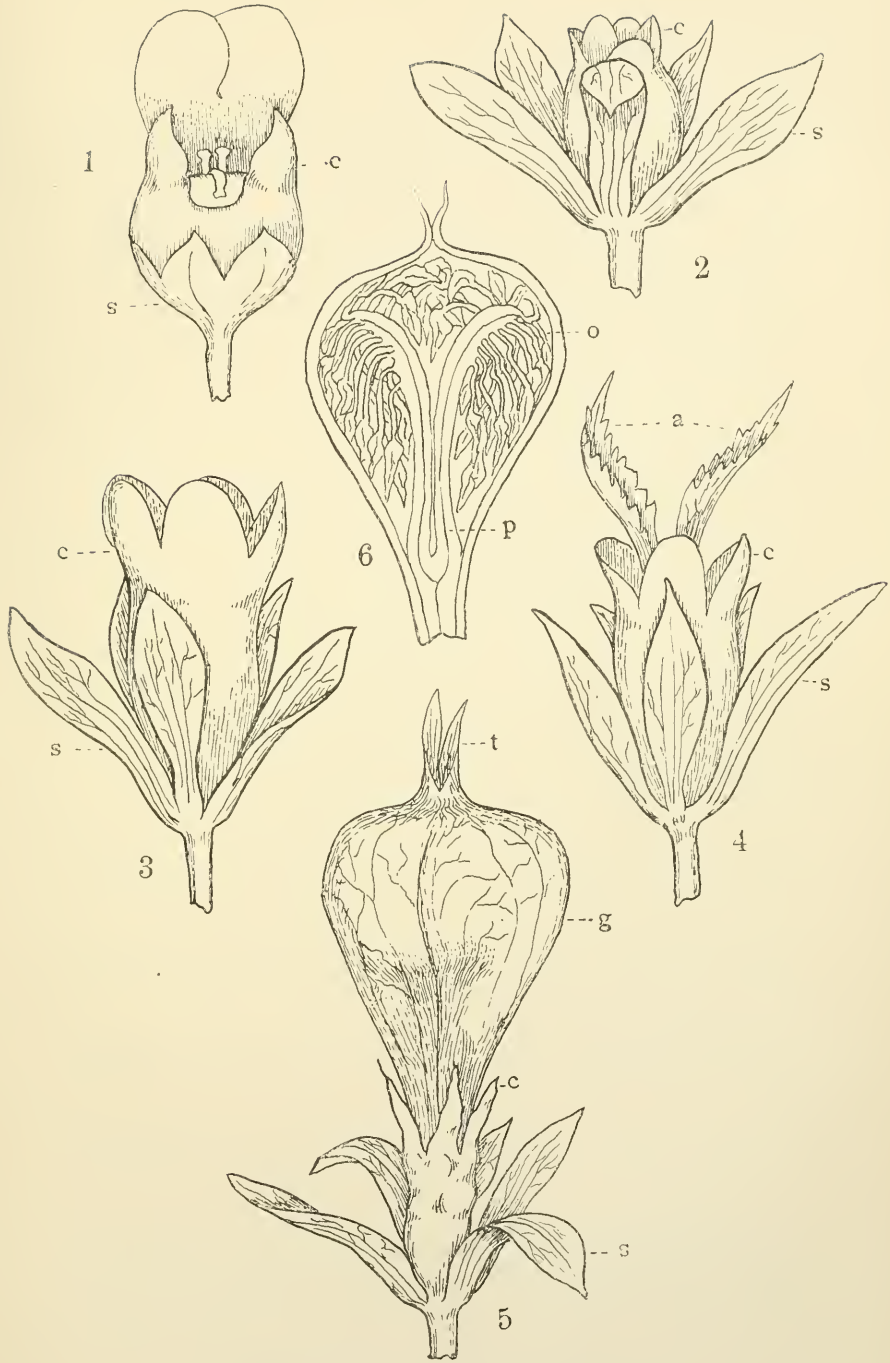
Variation 1.—Calyx-lobes 4, almost distinct, the fourth larger by half than the others and emarginate at apex; corolla little modified but with rotately spreading upper lobes.

Variation 2.—Calyx-lobes 5, the fifth largest and emarginate at apex; corolla lobes 6, subequal.

Variation 3.—Calyx and corolla normal, on same twig as Nos. 1 and 2 and immediately below them; ovary abnormal.

Variation 4.—Corolla somewhat tubular and prolonged (similar to Fig. 5, a). Calyx deeply parted as is usually the case.

Variation 5.—Abnormal flower on otherwise normal shoot; sepals 6; corolla with 6 lobes, 3 in upper lip, equal; sterile stamens 2, situated under middle lobe of upper lip but rather closely approximate. The specimen which bore this flower was collected in Berkeley but not from the station above described. The abnormal flower was discovered in October, 1898, by Miss O'Connell, a student in the Department of Botany, and called to my attention by Mr. A. A. Lawson.



SCROPHULARIA CALIFORNICA Cham.

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PLATE IV

Variation 6.—Middle lobe of lower lip largest, erect, the upper two spreading; sterile stamen, on upper side almost obsolete.

Variation 7.—Sterile filament well developed and with rather conspicuous free lanceolate apex.

Variation 8.—Ovary abnormal with two dilated lobes spreading from the top like mules' ears. Similar to Fig. 5, t, but far more pronounced.

Variation 9.—Ovary with truncate apex; style tubular, cleft at top into two lanceolate lobes.

Variation 10.—Fruit obovate, and didymous. The didymous character is caused by the growth of the little leaves (replacing the ovules), which growth is subsequent to the maturing of the pericarp. The lines of union of the carpels do not yield, however, although the sides of the "capsule" do, which thus results in the didymous form, which is very common.

Variation 11.—Placentæ elongated, distinct, and branch-like, fasciated, each slightly branched at apex and leaf-bearing; 2 valves of capsule replaced by ovate acuminate green leaves with more or less serrate margin.

Variation 12.—Pericarp open at top; placentiferous axis branching, each branch becoming fasciated and crowded with the small leaves.

Variation 13.—Placentiferous axis branching above the middle, bearing toward the base of each branch a foliaceous carpel, above fasciated and bearing leaves.

Variation 14.—Ovary replaced by a pair of lanceolate leaves, connate at base. Of frequent occurrence. Fig. 4, a, shows a similar case.

Variation 15.—Ovary entirely replaced by a leafy shoot. Of frequent occurrence.

It is easy to propound the question; What is the significance of these forms? As to the answer only a partial one may, at the present time, be had. It would be possible to say that the chorisepalous calyx and the regular corolla are reversions since on general

morphological grounds it is undoubted that Scrophularia and its allies have descended from ancestors with regular corollas (perhaps of the Solanaceous type), and more remotely with distinct sepals. But it needs not to be written down here, scarcely, that all the foliaceous developments which occur in the same flowers with regular corollas and chorisepalous calyces are not in anywise in the nature of reversions.

By "foliaceous" as applied to the carpels or ovules, I mean not merely the becoming green, but that these parts assume the characteristic structure of the upper foliage leaves of the species; they become not only ovate or lanceolate, but invariably more or less serrate and often slightly petioled. Thus a distinction may be drawn between the perianth and the pistil whorl, for the parts of the former may, and do, become herbaceous but not "foliaceous."

The behavior of the stamen whorl is in many ways the most interesting, in that, while the anthers are always abortive in truly abnormal flowers, in no case either during or subsequent to anthesis do they change their form, at least in appreciable or marked degree. On the other hand, the ovules, although not fertilized and incapable of fertilization (because abortive), frequently grow with rapidity and develop foliaceously, drawing to themselves the nourishment which would normally be received for the maturing of seed.

The soil in which these plants grow is very fertile and is rich in nitrogenous compounds.* That this superabundance of food may have something to do with the production of abnormal flowers is altogether probable. The writer may observe that he has discovered abnormal-flowered individuals of the kind here described, in Mendocino County, and that the soil was evidently of the same character.

EXPLANATION OF PLATE IV.

Figure 1.—Normal flower, showing bilabiate corolla (*c*) with erect upper lip of 2 lobes, middle lobe of lower lip closely reflexed with the deflexed style turned downward over it.

* The same hillside is the home of a cluster of poison oak (Rhus diversiloba) bushes bearing many fasciated branches; here have also been discovered several monstrous individuals of Ranunculus Californicus and of Eschscholtzia Californica.

Figure 2.—Sepals (*s*) much enlarged, broadly spatulate, and quite distinct; corolla (*c*) somewhat urn-shaped, with small equal lobes.

Figure 3.—Calyx (*s*) chorisepalous and green; corolla (*c*) somewhat tubular-elongated, its lobes equal; very usual form.

Figure 4.—Sepals (*s*) distinct and somewhat irregular; corolla (*c*) regular; ovary replaced by a pair of foliaceous carpels (*a*).

Figure 5.—Corolla (*c*) tubular with lanceolate lobes; ovary (*g*) obovoid, subtruncate at apex and raised out of the corolla on a stipe-like base; style (*t*) short tubular, cleft into 2 lobes. This form of "fruit" is very common.

Figure 6.—Cross-section of a typical abnormal fruit. Placentiferous axis (*p*) split at the top; upper part of placentæ crowded with small petioled ovate or lanceolate leaves (as at *o*) with serrate, margin which replace the ovules. If these continue to grow, as they commonly do, the wall of the ovary is ruptured and the green leaves protrude. Sometimes through growth of these parts the "fruit" merely becomes didymous, the sides (as in Fig. 5) becoming distended, while the line of union of the two carpels down the middle of the "fruit," which indicates the position of the partition, remains rigid and does not yield.

A NEW CALIFORNIA PARNASSIA.

By C. V. Piper.

Parnassia cirrata. Erect, 3–4 dm. high, glabrous throughout; radical leaves ovate, obtuse, palmately 5-veined, 1–2 cm. long, cuneate at base but not at all reniform; petioles 4–5 cm. long with a few fimbriæ on the margin of the dilated base; cauline leaf very small, about 6 mm. long, lance-ovate, obtuse, sessile: flower 2–2.5 cm. in diameter: sepals lanceolate, obtuse, 7 mm. long: petals oblong-obovate, 1 cm. long, the lower half margined with fimbriæ longer than the width of the petal: staminodia 5, as broad as the petals, 2 mm. long, cleft half way into about 12 equal, filiform, gland-tipped appendages: capsule ovoid, 1 cm. long.

Mt. San Bernardino, *S. B. and W. F. Parish*, No. 156 in 1879 (type). Upper Sacramento River, growing with Darlingtonia, *Brewer*, No. 1445.

Nearest *P. fimbriata* Banks, with which it is confused in the Botany of California. The new species is easily distinguished from *P. fimbriata* by its ovate not reniform leaves, small bract, longer fimbriæ, and especially by the staminodia, which are nearly those of *P. palustris*, excepting that the appendages are subequal. In *P. fimbriata* the staminodia have but 5 or 6 short blunt appendages. Mr. Parish writes that the plant is very rare in the San Bernardino Mts., as he has not met with it since 1879. The above specimens are in the Gray Herbarium.

Washington Agricultural College
and School of Science, Pullman.

EARLY SCIENTIFIC EXPEDITIONS TO CALIFORNIA.—II.

By Willis L. Jepson.

It was but a few years following the departure of the vessels of the ill-fated La Perouse Company from Alta California, that the ships of a second scientific expedition, commonly known as the Malaspina Expedition, in the course of a voyage about the world skirted the shores of western North America, and in September of the year 1791 cast anchor in the Bay of Monterey. These ships carried the royal banner of Spain; they had been fitted out at the king's command and were intended not only for discovery, but designed, indeed, for a scientific survey of the lands of the kingdom in the more remote quarters of the globe, that exploitation of the natural resources might be conducted with greater advantage to the mother country. The King of Spain at this time was Carlos IV, but the Malaspina Expedition, as planned and executed, was really the conception of the preceding reign. Carlos III, who had died in 1788, is generally conceded to have been the most liberal monarch that succeeded to the crown of Castile in the last century; in any event, his reign was in striking contrast to that of many modern Spanish rulers. He encouraged the useful and developed the fine arts, and was especially interested in the colonial possessions, in the development of commerce and trade with them, and in the acquisition of knowledge concerning their natural resources.

It was still a dream of Spanish geographers that exploration might demonstrate the existence of an inter-oceanic strait in northern America, and the discovery of this strait was also one of the objects of the expedition. So it was that Alejandro Malaspina, a capable navigator, in command of two vessels, sailed from Cadiz in July, 1789. The vessels were the corvettes Descubierta and Atrevida, the latter being under José de Bustamente y Guerra, second in rank. The scientific corps included apparently about half a dozen men.

The expedition touched the east coast of South America, and lingered a considerable period on the west coast, before proceeding on its mission of locating a northwest passage near Nootka. On the northward journey the ships stopped at Panama, Guatemala,

and at Acapulco, and on May 1, 1791, Malaspina sailed from the latter place for the purpose of exploring the northwest coast. These Spanish voyagers studied the coast line carefully as far, at least, as 60° north latitude, entering the sounds about what is now known as Vancouver Island, locating Mt. Edgecumbe near Sitka, and, finally, disheartened with the failure to discover the desired passage in the closed inlets of Prince Williams Sound, the ships directed their course towards the south, anchoring for a time in Port Mulgrave (or Yakutat Bay), the port Nootka, and tarried several days, to be exact, from September 13 to 25, in the Bay of Monterey, Alta California, where they received from their fellow-countrymen a most cordial welcome.

The botanists of the expedition were Luis Née and Thaddeus Haenke, and it is generally received that these were the first botanical travelers to visit California. In that excellent annotated "List of Persons who have made Botanical Collections in California," by Prof. W. H. Brewer, forming Appendix IV to the Botany of California, we are told that "the first botanists to visit California were Thaddeus Haenke and Luis Née." Dr. Howe, in ERYTHEA, Vol. I, p. 63, repeats to the same effect, and Professor Sargent, in his illuminating work, the Silva of North America, makes the statement[1] that "he [Née] and Haenke were the first botanists to visit California." The Bohemian botanist, Thaddeus Haenke, there can be no doubt, came to Monterey with Malaspina in 1791, but it is equally certain, it seems to the writer, that the distinguished Luis Née did not accompany the Spanish captain so far north but remained behind in Mexico. This appears clearly upon the authority of Bancroft,[2] and it is to be offered in addition that, although Née had a decided taste for collecting, no California plants are ever attributed to him save Berberis pinnata, published in 1803 by Lagasca in the "Elenchus Plantarum" of the Royal

[1] Vol. viii, 25.

[2] History of California, vol. i, p. 490, where may be found in a foot-note a full list of the officers made at Monterey. The scientific corps in part was as follows: Jose Espinosa; Felipe Bauza; surgeons Francisco Flores and Pedro Gonzales; apothecary Luis Née* and Tadeo Haenke; pintor de perspectiva Tomás Suria; désecador y dibujante de plantas José de Guio.* The names marked with a star indicate those who remained in Mexico.

Gardens at Madrid, but this was doubtless merely communicated to that author by Née.

Further evidence may be gathered from Née's own botanical writings. In the Anales de Ciencias Naturales, tomo ii, n. 9, we find descriptions of several new species of American oaks, of which Née is the author, including two from California, viz., the Valley Oak, Quercus lobata, and the Live or Field Oak, Q. agrifolia. This paper was republished in the Annals of Botany[3] of Konig and Sims, the Spanish of the article being translated into English, whence the following transcripts of the descriptions of the species just named:—

"8. Quercus agrifolia.

"Quercus foliis, lato-ovatis, subcordatis, dentato-spinosis, glabris: fructibus axillaribus, sessilibus.

"An Ilex folia agrifolii americana, forte agria, vel aquifolia glandifera. Plunkenet, tab. 196, fig. 3.

"I can not give the height of this tree, of which I have only seen branches collected at Monterey and Nootka by the marine officer Don Joseph Robredo, and Don Manuel Esquerra, paymaster of the corvette Atrevida. The bark of the branches is ash-colored and smooth. Leaves two inches long, and nearly as wide, are very smooth, veined, rather heart-shaped, with a small number of distant and prickly teeth. Male flowers sessile, on slender racemes two inches long; calyx shorter than the five filaments; anthers large, bilocular. Female flowers sessile, in the axils of the leaves, generally in pairs; cups hemispherical and furnished with loose yellow scales; the acorns three times larger than the cups (about 8 lines long), ovate pointed at the top.

"15. Quercus lobata.

"Quercus foliis lobatis, superne orbiculatis, basi cuneatis, lobis dentatis.

"Of this species I have only seen branches brought from Monterey by Sres. Robredo and Esquerra; they are alternate, sulcated, and smooth. Leaves alternate, rounded at the top, cuneate toward the base, four inches long, and two and a half wide in the middle and towards the tip; margins deeply sinuate, lobes obtuse, toothed; petiole thin, 3–4 lines long."

[3] ii, 98 (1806).

The above descriptions are the first scientific accounts of any Californian trees, and in the above extracts there is ample room for inference—had further testimony been needed—that Née did not visit California.

The first botanist, then, to make an herbarium of Californian plants which reached Europe was Thaddeus Haenke. Something concerning his life may, therefore, be adventured on these pages, with the thought that it will not be devoid of interest to students of west American botany, for he appears to have been a man of parts.

He was born at Kreibitz, in Bohemia, on the 5th of October, 1761, and received his early training from an uncle, who was a theologian. Later, he went to the University of Prague, where, in 1782, he was honored with the degree of Doctor of Philosophy. He next began the study of medicine, but devoted most of his leisure time to botany and botanical rambles. A disposition towards this science he owed to the professor of botany in the university, Joseph Godfred Mikan, in whose home he now was. For several years he traveled extensively in Bohemia, wrote a "Florula of Sudetic," published by the Bohemian Society of Sciences, studied under Jacquin, acquired intimate acquaintance with all the leading scientific men of the day in his country, when, in the 28th year of his age, an event happened which was to change entirely the current of his life. At the "command of the Emperor Joseph II" he willingly undertook service under the King of Spain as one of the corps[4] of naturalists engaged to accompany the Malaspina Expedition. He arrived at Cadiz too late to join the corvettes, followed, however, in the first vessel leaving for the New World, suffered shipwreck on the west coast of South America, escaping only with "his Linnæus," and finally joined Malaspina at Santiago in Chile. His collections from South America, from Nootka, Port Mulgrave, Monterey,[5] San Blas, Acapulco, testify his

[4] His official title reads thus: Fisico-Botanico, Comisionado Por. S. M. Católica.

[5] These, as most of his plants, were published by C. B. Presl, in the Reliquiæ Haenkeanae, and consisted chiefly of grasses, rushes and sedges, and of the following exogens characteristic of the Californian summer and autumn hills and low plains: Datisca glomerata, Zauschneria Californica

scientific ardor. He made a journey from Acapulco to the City of Mexico, accompanied the expedition from Acapulco to the Philippine Islands, where he botanized extensively in the island of Luzon, and eventually returned to South America.

Here was an untouched and indescribably vast field awaiting this investigator of nature, and from Cochabamba, in Peru, which he eventually chose for his home, he made journeys not merely of hundreds but of thousands of miles, following uncharted rivers through wildernesses and traversing lofty mountain chains. Here, moreover, were nations of savage or half-savage peoples, and on account of his reputation for prudence and sagacity, and his extensive ethnological and linguistic knowledge, he was frequently sent by the King on political and judicial missions to scattered villages and distant provinces and as envoy to hostile or warring tribes. To the untutored people of his own vicinage he was at once a protector, a physician, a seer and an expounder of the Divine Word. And yet, notwithstanding manifold duties, he found leisure for the study of physics, chemistry, botany, mathematics, and music, and to found a botanic garden in Cochabamba. In such manner Haenke gratified his love for scientific study, exploration and discovery, and at the same time served the King of Spain; but during all these years the heart of the Bohemian naturalist and voyager ached for his native land. His botanical collections, his notes, his drawings were invariably accumulated with one thought—the idea of return to Europe that he might possess himself once more of scientific advantages in his fatherland denied him in Peru. His letters to his relatives and his friends ever breathe plans for his home-coming, the study of his material and the elaboration of the results of his prolonged investigations in the New World, the publication of which he preserved for himself. All this accomplished, there was the pleasing prospect of philosophic quiet in his own country, surrounded by old acquaintance and familiar scenes. To

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and Frankenia grandifolia. Of exogens, either very few were collected or, as seems more likely, they shared the fate of certain South America bundles which were lost. The full title of Presl's work reads thus: Reliquiæ Haenkeanae sue descriptiones et icones plantarum, quas in America meridionali et boreali, in insulus Phillipinis et Marianis collegit Thaddeus Haenke, Philosophiæ Doctor, Phytographus Regis Hispaniæ. Pragæ, 1830–36. Two folio volumes.

his scientific friends, notwithstanding his long-continued absence, he remained always "our Haenke."

But it was fated that he was never to return to Bohemia. Singularly enough, he "escaped the ferocity of the Indian tribes of the forest, the voracity of the wild beasts, the atrocity of the reptiles, the pernicious puncturings of the insects, and the rains and floods of waters," as Count Sternberg, the author of the biographical sketch in the "Reliquiæ Haenkenae," somewhat luridly puts it, only to meet death in the year 1817 by accidental poisoning within the walls of the house on his own estate, his premature end being brought about by a servant mistaking a toxic fluid for a medicine.

The life of such a man possesses elements of interest for all botanists, regardless of tongue or nationality, and as a member of the Malaspina Expedition to the Pacific Coast of North America, the incidents of his career appeal especially to naturalists residing in California. It pleases us, in good truth, that the first botanist to visit our shores should have been so remarkable a botanical worthy, that he should have been celebrated not only for his scientific enthusiasm, but also for his wisdom and his humanity. Therefore, happy in claiming a small share of direct interest in Haenke's life-work, we join, nearly a century later, in the invocation of his fellow-countrymen on hearing his death: *Sit illi terra lævis.*

FIELD NOTES FROM SANTA CATALINA ISLAND.

By Blanche Trask.

Mr. Lockwood, in a recent article upon "Carrier Pigeons," in the *St. Nicholas* magazine, was most happy in saying that Catalina Island was "in shape not unlike a giant's footprint." The island is about twenty-two miles long and from three to eight miles wide. It is cut into almost two islands, for at "The Isthmus" it is but a quarter of a mile from sea to sea, though on either side there are lofty peaks.

Two or three fishermen live at "The Isthmus." Avalon is a tent city, which year after year, from June to September, renews its life; like the Selaginella quick to respond to the opportunity and as suddenly fading away—not to death, but to its semblance, sleep. There are scarcely a hundred people left over in Avalon "after the season."

On the summits, "The Ridge" is not the narrow strip it looks from below; one is surprised to find many an undulating stretch where he may wander for hours without beholding once the sea; here and there a mesa, and, indeed, "uplands vast," where only the wild goats and sheep wander and the little silvery foxes live. The highest peaks range at about 2,000 feet. Mexican Joe, the old-time guide, states that there was once snow on "The Ridge," but that it has never been known in the valleys.

There are deep craters surrounded by mountains of rocks overburnt; there are cliffs all the hues of the rainbow, some in such tones that to speak of their color is impossible—such strange blendings of violet and rose call for new words: there are crags whose rocks crash down a thousand feet into the sea below, where they are laved by green-blue waves—waves whose wondrous coloring is stolen from the rocks and by many a spiral and labyrinthine trail carried out into the deep. In these strangely-colored waters the brown "mermaid's hair" sways to and fro, goldfish hide in the tangled weeds, and to look down upon it all from the heights, well repays one for the tramp from Avalon.

Arroyos are everywhere, making now and then terrible leaps; there is seldom water in their beds except during the rainy season.

Springs there are, indeed, but hidden—unless you happen "to know," the search for them would be well-nigh fruitless.

Disintegrating rock is everywhere; boulders are falling and crumbling, even on "The Ridge," and from the highest peaks as well as from the edges of the sea-cliffs. It will consume an hour to make an ascent of from two to three hundred feet in such places, every rock, great and small, breaking into pieces at touch of hand or foot. Such climbing, it is needless to say, is dangerous. It is, however, only after such efforts that one can properly estimate the common blessing of being able to walk about, without thought, on a reliable foundation.

There is a tragic significance in the large number of slopes which are covered with the bleaching trunks and roots of trees and shrubs, uprooted, doubtless, by the rocks which crumble in the swiftly-running waters, for in the heavy rains the fall is great and very fast. One asks, "What is to replace these thousands of trees and bushes?" Adenostoma, Heteromeles, Ceanothus cuneatus, Cercocarpus, Rhamnus, Eriogonum, Artemisia, Salvia? On the other hand, there are some species which seem to be less on the decline or are more than holding their own.

The fine-rooted Rhus integrifolia, R. laurina and R. ovata cling to the perilous edges of every sea-cliff. Cerasus ilicifolia holds slope after slope as its territory, rising from twenty to forty and even to fifty feet in height, twisting about the rocks, its long roots exposed from fifteen to twenty feet. It seems as though in time this cherry would cover all the northern slopes at least. The var. integrifolia forms groves on moist slopes, and indeed fills many small cañons. It differs from the ordinary form as follows: 30 to 50 feet high; leaves orbicular or obcordate, entire, never "spinosely toothed," quite thin and shining, 3 to 6 in. long, petioles half as long; fruit always black, an inch in diameter.

Ceanothus arboreus is abundant on all the high slopes, and is twenty to twenty-five feet high. It blooms, in "a wet season," in January; the black fruit ripens in June. Ceanothus cuneatus, var. macrocarpus, in the same month gives to all the high, dry slopes the appearance of having been visited by a light snow-storm. The former species inhabits moist slopes, and its "clean trunk and open but round head" is in great contrast to the gnarled,

crabbed variety of C. cuneatus, which, no doubt, regards its beautiful lavender-flowered relative with envy.

There are large groves of Quercus tomentella in a cañon near the middle of the island, with trees over fifty feet high, and so closely set that the sunlight peers in wonderingly, and searches among the fallen leaves for the acorns, and the little stream trickles along not knowing through what rare shade it flows. And here is one large Quercus MacDonaldi, if there be such a species! For those who think they know differ. The Scrub Oak is always at hand, and is a variety of Quercus dumosa.

Late in June, Rhus laurina blooms; it is abundant. Spiræa ariæfolia flowers in the same month; it has been found in but one cañon.

In autumn, Rhus diversiloba, in company with the red-berried Lonicera hispidula and its yellow-berried relative, and the white-haired Clematis climb Populus trichocarpa, which thrives in all cañons, large and small, where there is water for its roots. On all the Cottonwood trees noticed, the staminate ament is as long as the pistillate.

In open places where Rhus diversiloba finds no support, it abandons the hope of leaning, and does its best to become a tree, although a very poor sort of a tree it usually is; if chance offers, it gladly takes the first opportunity to climb. However, in La Canada Diablo there are fine arborescent specimens fifteen to twenty feet high.

Mr. Lyon speaks of a trifoliate form of Rhus integrifolia, and Mr. Brandegee says: "The ternate leaves are usually scattered among those of the normal shape, and no bush with any large proportion of the abnormal ones was seen." I have collected the ternate-leaved form in every part of the island. There are trees on five trails leading in as many directions out of Avalon. It thrives at the extreme "West End." It is found in the broad, sunny, and valley-like cañons of the "South Side" as well as in the narrow arroyos which lie like green threads between the shattered cliffs at the "East End." In two cañons it predominates.

It is as though some new life principle has touched the hearts of the Rhus leaves. While upon some trees there is found only now and then a ternate leaf, all the other leaves seem to be turning and

twisting—sometimes becoming quite undulate, so that in the press they are crushed, because they can not be laid flat. Then, again, in their efforts they become misshapen, appearing with irregular scallops where new leaflets should be, and even notched in the wrong places and occasionally narrowed at the apex and broadened at the sides, and rarely a fine trifoliate leaf is lobed as though making yet further effort for other leaflets. Among these peculiar states the heart-shaped form is conspicuous.

Rhus ovata is abundant in three of our largest cañons. With its clean trunk and bushy head it reminds one of orchard trees, though upon close inspection it is found to be extremely crabbed.

Beyond "The Isthmus" Arctostaphylos bicolor occurs frequently; it is from eight to twelve feet high. A. diversifolia is found in but one cañon, and differs from the characterization of the species in the books. It has white flowers and only the very young leaves are "willow-like;" the others are extremely coriaceous. There are three trees from twelve to fifteen feet high.

Eriogonum giganteum is found occasionally twelve inches in diameter and as many feet high. The normal size abounds, the usual diameter ranging from six to eight inches.

There is one Sambucus glauca in Grand Cañon which measures twenty-seven inches in diameter, an unusual size, the largest seen.

With the aspect of the "Weeping Willow," its pendulous branches over six feet long, Cercocarpus parvifolius thrives on all the moist slopes, now and then attaining the height of forty feet. By its side, a variety of Rhamnus crocea grows to be fifteen to twenty feet high.

Where water remains all the year round, either above or below the sandy bed, the willows thrive, often becoming tall trees. Salix lasiolepis is, perhaps, more frequent than S. lævigata.

Save on arid slopes Heteromeles arbutifolia abounds, the trunks often one foot in diameter. A form with bright orange-yellow fruit has been found in several localities. It differs, like our red-berried sort, from the character given in Botany of California as follows: Leaves usually entire, "sharply serrate" ones occur but rarely, often not one such leaf on a slope covered with this species; petioles from six to twelve lines long.

Vast areas of the dry uplands seem again, in June, to be vis-

ited with light snows. It is the blooming-time of Adenostoma fasciculatum.

Another striking plant is Eriophyllum Nevinii; its foliage gleams like frost-work on the cliff-sides and in June its gold flowers begin to shine against the silver. Here, too, on the dry cliffs, glow the autumnal-tinted flowers of Hosackia argophylla. This Hosackia is here decidedly woody at base, though coming under an "herbaceous" section in the classification of the species in the Botany of California. The stems are from four to six feet long; and even when mature, it is still "silvery." Near by, the papery pods of Astragalus leucopsis, also red and yellow tinted, rattle in the sea-breeze, while above them all Audibertia polystachya raises its arms.

Later, the gay Zauschneria Californica joins the assembly on the cliffs, while on the tip-top ledges the pink Eriogonum giganteum has its habitation. Mr. Lyons speaks of the "cream-colored flowers" of E. giganteum, but I find them always pink on expanding, though they usually fade to "cream" in a day. Eriogonum nudum is also at hand, as well as Cotyledon cæspitosa and, less frequently, C. lanceolata.

This[1] being "a wet season," Crossosoma Californica was in bloom before Thanksgiving. In character, it differs from that given in the Botany of California as follows: Young shoots glaucous; leaves, oblong and obovate, retuse and often sessile; arboreus, twelve to fifteen feet high. Mr. Brandegee[2] says he frequently found as many as nine carpels; I have rarely found so many, three to seven being the usual number.

In four localities Antirrhinum speciosum has been collected. It loves bold crags, where the flowers hang over the sea, like red corals on green strings. At its best, it is about ten feet high. It is continuously in flower.

In March, Leptosyne gigantea blooms, usually on the broken edges of sea-cliffs, but there is a valley a mile inland where it grows on the summit of a little peak which rises abruptly from a small valley. Here the Indians a long time ago carved their pots out of the serpentine, for the marks of their implements are still fresh, and you may walk through a vale of broken pots.

[1] 1896–97.

[2] Zoe I, 109

Lavatera assurgentiflora grows in a depauperate condition on Bird Island, for there is hardly any soil on this great rock—for rock it is—of the shags and gulls. Yet specimens brought from this islet to Avalon, have now reached a height of over twenty feet and are always in fruit and flower. Just where Mr. Lyon found it "growing luxuriantly" is a mystery. On a rock three miles distant from "Bird Island," L. assurgentiflora grows in about the same state as on "Bird Island." "Bird Rock"—sometimes called "Ship Rock," from its resemblance to a ship in full sail—still seaward from "Bird Island," has had no sign of plant-life for the last ten years; so I am told by a reliable old fisherman, who makes frequent visits there. There are no other islets about Catalina.

On two sea-cliffs Cereus Emoryi grows. Opuntia Engelmanni var. littoralis abounds. O. prolifera, included in Mr. Brandegee's list, I have not seen.

There is a luxuriant growth of Vitis Girdiana in one cañon.

In Avalon, Lycium Richii forms an impenetrable arbor-like network, about one hundred feet in circumference and twenty-five feet in height. Dr. Hasse says it has grown rapidly, since he first noted it, over ten years ago. Its pale lavender flowers and small red berries are always seen on its virgate branches. The largest branches are six inches in diameter.

A snow-white form of Orthocarpus purpurascens grows in several localities, but does not differ except in color from the ordinary form.

There were two specimens of Mentzelia micrantha found last season whose largest leaves measured seven inches from base to apex—an unusual size.

Beset with long white hairs which glisten in the sunlight, Scrophularia Californica is far from being the "homely weed" it is on the mainland. Its virgate, flowering branches are two feet long and rise from four to six feet above one's head.

The blue-purple flowers of Solanum Xanti var. Wallacei, observed in eight or ten localities, are about two inches in diameter. Mr. Lyon speaks of its black fruit being edible; I can learn of no one having eaten it, save two little boys of Vicente's—an old-time fisherman—and they were quite ill in consequence. I must except Vicente himself, who can eat two or three berries without any ill effects.

Galium Catalinense is abundant on rocky slopes and sunny cliffs.

We have a very peculiar form of Œnothera micrantha with numerous decumbent stems, three to four feet long; bark shreddy; leaves at base cespitose, two to three inches long, the upper smaller, very wavy, somewhat dentate and clasping.

Ribes viburniflorum thrives in all parts of the island in moist places. Its leaves shine in the sun and it is exquisitely fragrant occasionally; it covers the steep walls of one cañon that I know to the height of a hundred feet for a stretch of a quarter of a mile or more. This cañon—and if it is ever honored with a name, it should indeed be that of "Currant Cañon"—which consumes two hours in tramping from its head to the sea, is clothed with this beautiful Ribes—mile after mile of overhanging rocks being festooned with its branches.

In Pebbly Beach Cañon, one specimen of Specularia biflora was collected, peculiar in its construction, having four stigmas, six stamens and a small sixth lobe to the five-lobed calyx.

An anomalous specimen of Godetia tenella was collected and proved very interesting. It had four stamens with long filaments and the anthers purple and arcuate, and four stamens with filaments half as long and anthers yellow; all the anthers ciliate with short white hairs and somewhat pubescent with scattered hairs; stigma lobes white, purple tinged; leaves barely petioled.

Mr. Lyon speaks of the absence of Brodiæa capitata during the time of his visit, although he says it was collected here in other years. For the last three seasons, at least, it has been abundant. Brodiæa minor is rarely seen.

A wonder in beauty is Mirabilis Californica and fittingly named. The plant differs in many respects from the ordinary form. Plant not "yellowish green;" stems three to four feet long, mostly decumbent from "a decidedly woody base," half an inch in diameter; leaves hispid-pubescent, the short, stiff hairs mostly recurved, "from a distinctly pustulate base," the margins beset with stiff hairs; pubescence slight upon the stems and young leaves; petioles twelve lines long; involucre six lines long; perianth twelve lines long, with yellow, five-rayed eye; fruit six lines long.

Lyonothamnus floribundus is hardly so rare as reported by Mr. Brandegee. I have found more than a dozen groves on the larger

part of the island, this side of "The Isthmus," as we say, while beyond "The Isthmus" it is here, there and everywhere—a veritable Lyonothamnus land. This "rare" tree blooms in June. In only two groves I have found divided leaves; yet a tendency toward divided leaves and imperfectly divided leaves is everywhere present; indeed, in most groves the exception is the entire leaf. The flowers are white and the clusters are very showy. The groves stand on steep slopes among great rocks. The finest specimens are over forty feet high, straight and slender, branching near the top, the first limbs having apparently died away. The bark hangs in long shreds. There are groves on slopes 500 or 600 feet above sea-level; several are also found at about 2,000 feet elevation, on one of our highest peaks, just above one of the old craters, the only green which touches this desolate height.

A single specimen of Marrubrium vulgare was collected at Avalon last summer by Dr. Bishop. Alyssum maritimum was also found on a cliff-edge.

Gymnogramme triangularis is found not infrequently, but the var. viscosa is on all moist slopes and in every cañon, together with Adiantum emarginatum. Polypodium Scouleri is not abundant as is P. Californicum. Cheilanthes Californica and Aspidium rigidum (or A. aculeatum) are fairly represented on moist slopes and in the cañons, while fine specimens of Pellæa Andromedæfolia are hidden away in "the bushes" on the open ridges and Pellæa Ornithopus abounds among all the cacti. Here also are the white flowers of Convolvulus occidentalis.

Fine specimens of a Delphinum are found on dry hills in March, with the bright Erythræa venusta at its feet.

In Avalon Cañon, Eulobis Californicus was found in one locality, with a "decidedly woody base;" in the same locality was Antirrhinum strictum with woody base, one-half inch in diameter; the plants were about three feet high.

On arid heights Gilia dianthoides flowers profusely; a stem scarcely rising out of the ground, will bear half a dozen blooms—large, white, and fragrant.

The violet-blue flowers of Nemophila aurita are seen on nearly all cañon sides. N. insignis thrives in one locality.

A species of Nicotiana was discovered on Fisherman's Beach

last summer. It was about twelve feet high; with yellow flowers; leaves, thick, ovate, glaucous.[3]

Pentstemon cordifolius and Lathyrus vestitus grow among the low trees on the ridges. Protected by other shrubs the fragrant Artemisia Californica attains a height of ten and twelve feet and the trunk becomes six inches in diameter. Among the cacti, on a dry slope above the sea-cliffs, I came across, one day, a fine specimen of Malvastrum Thurberi. I have before collected in one locality a shrubby sort with expanded and racemose inflorescence. This I speak of now was, however, really tree-like in appearance, about six inches in diameter at base, and ten feet high, with "wand-like branches" six to eight feet long, on all sides from the base up, given thereby a singularly orbicular form. Flowers "sessile in an interrupted naked spike," densely crowded, by no means "small" (Botany of California); the petals more than an inch long; nor were the "calyx lobes short" (Botany of California), being from three to four lines long.

Just at the foot of one of our highest peaks, Eriodictyon Traskiæ covers a large area; I have seen it in no other locality. Pectocarya penicillata is abundant; hill upon hill in the arid uplands is carpeted with it.

Nearly every little stream which continues to keep its head above sand and rock the year round, is fringed with Mimulus cardinalis and occasionally with M. luteus; M. floribundus is more rare. M. glutinosus adorns "hill and dale" at all seasons, with its bright red-and-salmon-colored flowers.

In April, Calochortus Palmeri appears on all high, dry slopes and hills; and C. Catalinæ, or as some would say, C. splendens, follows a little later. It depends, as Mr. Brandegee says, "upon whether this species is distinct from C. splendens."[4] Be this as it may, the species in question is rarely found and one may tramp all day without beholding a single bloom.

About five years ago, Mr. Harry Polley discovered a solitary Cornus. The tree is about twenty feet high, six to eight inches in diameter, with long, "red-purple" osier-like branches. It has

[3] Probably N. glauca Graham, which is becoming extensively naturalized. —Ed.

[4] Zoe, I, 146.

cream-colored flowers and lead-colored fruit. The species has not been seen elsewhere, nor any representative of the genus, though the specimen referred to is multiplying by shoots at the base.

It is seldom that Eschscholtzia Californica is seen here, but there is a very small poppy, which rarely reaches over eight inches in height; it is frequent on high, dry hills, and is most commonly three to six inches high. Miss Eastwood writes me that it may be E. ramosa Greene.

There is a Lupine frequently met with which Miss Eastwood thinks an undescribed variety of Lupinus truncatus.

In one locality Sarcostemma heterophyllum covers a great rock which, falling from an overhanging cliff, has nearly filled the narrow arroyo.

A dainty plant is Hosackia micrantha; in a few localities it is abundant; "very slender and diffusely procumbent," with tiny yellow flowers and long attenuate, shining, red-brown pods. It is one of the first flowers to appear after the rains. H. strigosa has rarely ten leaflets; pods often recurved and pubescent. H. maritima has decumbent stems over a foot in length and it is frequently six-foliolate.

Trifolium tridentatum is found everywhere; T. ciliatum, T. Palmeri, T. microcephaleum occur frequently; T. Catalinæ inclines to dry slopes by the sea, while T. amplectens thrives on uplands of about one thousand feet elevation. During the summer months Medicago sativa blooms in Avalon Cañon. Lupinus hirsutissimus is frequent and is three feet high; pods two inches long ("an inch long," Botany of California), exceedingly hirsute.

As to trees, we certainly have trees, though they are mostly out of view in the deep cañons, low-set bushes being noticeable on the otherwise bare hills. Even Rhus integrifolia often takes on an arboreus form, attaining a height of twenty and twenty-five feet, with trunk a foot in diameter. R. laurina has been found two feet in diameter; Rhamnus crocea, Rhus ovata, Heteromeles arbutifolia, and indeed all the shrubs become arborescent and arboreus as opportunity offers; and remembering Lyonothamnus floribundus, Quercus tomentella, Q. oblongifolia (or Q. MacDonaldi), Salix lævigata and S. lasiolepis and Cercocarpus parvifolius, there can be no doubt that we have trees.

The famous "Yerba Santa," Micromeria Douglasii, to which Mexico Joe attributes the power of inducing "a gentle sleep," is found in one cañon only. The dried leaves, when steeped, make a pleasant, fragrant tea. A tea is also made from Pellæa Ornithopus; "Tea Fern" is the local name, and its delicate fragrance is unsurpassed; it is said to be a tonic as well.

This recalls the medicinal properties which Cereus Emoryi is reputed to possess. The information is from the reliable old fisherman, John Sullivan, before mentioned. He went to gather it at the urgent request of a Mexican woman, for the purpose of making for her husband, ill of a fever, a healing concoction. It is, also, no doubt, well known that the Indians used to make a liniment from the willows. There are, besides, plants to allay thirst. If a Mexican, when thirsty, comes across a Cotyledon he eagerly seizes leaf after leaf and extracts the water. The fruit of Opuntia Engelmanni var. littoralis makes a delicious pudding. The leaves of the "Sour Oak" (Rhus integrifolia) are said to have a wonderful curative effect on rheumatic pains, if rubbed upon the affected part. This last from one of the old seers of Avalon, "who knows"! A fine drink is also made from the berries of R. integrifolia; "the icy-looking white substance" (Botany of California) with which they are coated, becoming, when fully ripe, bright red, very thick, juicy and bitter-acid. The drink requires sugar to be valuable in allaying thirst, when water can not be found on the trail.

The tree-poppy, Dendromecon Harfordii, is very rare. I have walked and re-walked the ridge from end to end of the island, have been in all the large cañons and many small ones, and I have seen but seven trees, besides the eleven which are within the radius of a half mile. The fisherman, John Sullivan, says he has never seen one "beyond 'The Isthmus.'" It blooms continuously; flowers often three inches in diameter; pods four to five inches long; margin of leaves smooth, though the young and thin leaves have occasionally a denticulate margin or are merely "rough;" leaves usually distinctly petioled and acute at base, very variable in shape, usually oblong-elliptical, rarely ovate, occasionally spatulate. New shoots from a fallen trunk had their smooth-margined leaves spatulate, over an inch broad, and one and one-half inches long. The shredded bark is very conspicuous on all trees here. The species is

twelve to fifteen feet high, and with the trunk from six to eight inches in diameter. It branches at four or six feet from the ground and, apparently unable to bear its weight, bends forward, while from the branches long shoots ascend, reminding one of the peculiar growth of the elder. The bending and shooting are repeated again and again ; meanwhile, it has turned to a neighboring shrub (invariably Ceanothus cuneatus var. macrocarpus) and the new branches and young shoots adapt themselves with the greatest dexterity to the twists and turns of the Ceanothus, leading one to suspect that prehensile branches have been given the Dendromecon, because of necessity; for thus the weight of the branches are borne by other trees and the trunk of the Dendromecon saved from breaking. There are several fine Poppy trees which are lying broken into a hundred pieces, having crashed down at the falling of their support—Ceanothus cuneatus. The Tree Poppy is very brittle; it is almost impossible to gather flower or pod without splitting off large branches. Ceanothus cuneatus, though tough when young, grows brittle as it is gradually uprooted, and it is always being washed out at the roots in the rains. Growing in dry, craggy places, the Tree Poppy finds no better support than the little twisted "White Lilac," so its fate can be readily perceived, and it is not strange that in the length of the island it has been found in but eight different localities.

The writer is deeply indebted to Mrs. A. Wheeler, former resident amateur-botanist at Avalon, for information in regard to the habitat of many of the island's rare plants, and to Miss Alice Eastwood, Curator of the Herbarium of the California Academy of Sciences, for the naming of many specimens.

Santa Catalina Island, 1897.

REVIEWS AND CRITICISMS.

The Evolution of Plants. By Douglas Houghton Campbell, Ph. D., Professor of Botany in the Leland Stanford Junior University. [MacMillan Company, New York, $1.25.]

While the scope of this book includes discussions of or at least touches upon nearly all the important phases of work which absorb the energies of modern botanists, this is indeed the first book to present under this title a "connected account of the development of the plant-kingdom from an evolutionary standpoint." Nor is this to be deemed remarkable when we remember the vast number of forms which comparatively recent exploration has brought to light, that there are large groups which have been imperfectly studied, that affinities in many fairly well-known groups are little understood, and that every day new problems are facing the active investigator.

As the author says, there is nothing new in this book, and yet this fact by no means withdraws the volume from the category of very new books. A restatement of more or less well-known results of research either for the purpose of coordinating scattered facts, of discussing indistinct or little-apprehended relations, or bringing into clearer view a scheme of phylogeny, is always to be welcomed. Doubtless the most conspicuous merit of the book is its reliance upon authoritative investigation. It is easy to speculate; indeed, there is nothing more seductive than speculation upon such a topic as the origin and ancestry of groups of plants. The treatment here, however, is most conservative; the attempt to follow completely the lines of development is marked by caution and a commendable scientific sobriety.

For this reason, the book is scarcely open to adverse criticism except in some matters of detail. One of the most useful features to the teacher who may use this as a text to put in the hands of students is the phylogenetic tables, or, as the author more prudently calls them, "diagrams to illustrate relationship," which will afford a definite basis for suggestive discussion.

In many ways the most interesting stage of the phylogenetic line or lines is in the transition region between the lower and higher forms, between spore-plants and seed-plants. While the author

favors the theory of a polyphyletic origin, not only for the Angiosperms, which is coming to be generally conceded, but for the Gymnosperms, his discussion of the latter phase is less full than we should have liked.

The treatment of the evolution of plant forms, it should be noted, is here restricted almost entirely to a consideration of the reproductive organs, their development and differentiation, and of sex relations. The book is said to be intended also for "those general readers interested in biological problems." We fear that such, of this generation, will find the style of presentation, not too abstruse, but rather too far removed from the form of exposition that is termed popular, and will be disappointed, in addition, at finding so little space given to the discussion of the forms of the higher plants, especially those which compose the plant communities of forest or meadow or give character to desert scenery and attract the attention of the traveler. The chapters on Geological and Geographical Distribution, Animals and Plants, and Influence of Environment, will only, in part, compensate this type of reader.—W. L. J.

The Phylogeny and Taxonomy of the Angiosperms. By CHARLES E. BESSEY, PH. D., Professor of Botany in the University of Nebraska. [Bot. Gaz. xxiv, 1–34.]

With a more intensive study of the structure and morphology of the natural orders of flowering plants there has been for a number of years a manifest disposition to break up the artificial group Apetalæ of Benthan & Hooker, and to redistribute many of the families therein included among the Choripetalæ, placing them next to their nearest Choripetalous allies. Such a redistribution usually implied, that the families under consideration were reduced and not primitive forms. This tendency has reached its extreme phase in Dr. Bessey's instructive paper, a paper which carefully and effectively summarizes the results from paleontology, embryology and morphology. We here find in his segregation of the Choripetalous families into groups, illustrated further by a phylogenetic table, that all families of the "Apetalæ" have been distributed, and that no group of primitive Apetalæ stand at the foot of the Choripetalous tree. For example, his suborder Carophyllales definitely includes Caryophyllaceæ, Frankeniaceæ, Tamaricaceæ,

Salicaceæ, Portulaceæ, Ficoideæ, Phytolaccaceæ, Nyctaginaceæ, Illecebraceæ, Amaranthaceæ, Chenopodiaceæ, and Polygonaceæ. His suborder Sapindales includes Sapindaceæ, Sabiaceæ, Anacardiaceæ, Juglandaceæ, Betulaceæ, Fagaceæ, Myricaceæ, Casuarinaceæ(?).

It is generally admitted that some families of the Apetalæ are "reduced" or at least have their nearest affinities with certain Choripetalæ, but other families are, with equal reason, it seems to us, to be looked upon as primitive. The Oak Family, Cupuliferæ, Mr. Bessey has disposed well along the line of his "Calycifloræ Inferæ," which line begins with Rosales. The woody fruit of the oaks, the slow growth of the pollen-tube which has begun its journey through the stylar tissue long before the formation of ovules, the simple character of the flowers, their ancient geological history—these and other features of this family, which is taken as an example, have inclined us for many years to look upon them as primitive plants. Dr. Bessey does not give reasons for the faith that is in him, but the particular relationships in these suborders of dicotyledons he promises to publish in a later paper.

His phylogenetic table shows for exogens two diverging lines; one beginning with Ranunculaceæ and ending in Labiatæ, the other beginning with Rosaceæ and ending in Compositæ; each begins with apocarpous, choripetalous plants with superior ovary; each attains syncarpy and gamopetaly, the first remaining hypogynous, the second becoming epigynous.—W. L. J.

SHORT ARTICLES.

ARENARIA PALUDICOLA.—For some years *Arenaria paludicola* Robinson (A. palustris Watson) has been believed to be extinct around San Francisco, which is the type-locality of the species. However, this is not so, as it was found quite abundant in a marsh near the Presidio, early last summer, by Mr. J. W. Congdon. It grows amid a clump of sedges and rushes in the marsh opposite the Life-Saving Station between the Presidio and Fort Point.—ALICE EASTWOOD.

Introduced Plants in Placer County, California.—Miss Margaret Adamson has recently found *Martynia proboscidea* Glox. growing plentifully in the fields around Penryn, Placer County, California. This is the first record of its introduction into California. The specimens are in the Herbarium of the California Academy of Sciences.

She also brought specimens of *Sagittaria Montevidensis* Cham. and Schlect. As this has been reported from so few localities in California, it seemed well to make a note of the new locality.—Alice Eastwood.

Sedge Used in Indian Basket-making.—The Herbarium of the Academy of Sciences has lately received from Mrs. M. E. P. McCowen, of Ukiah, specimens of *Carex Barbarœ* Dewey, with leaves ten feet long. This Carex is one of the most important fiber-plants of the Indians of Mendocino County. Mrs. McCowen writes, that the Indians use the long fibrous roots in the manufacture of their baskets. The specimens that she sent came from a plant, which had been transplanted to a marshy place near Ukiah. The identification of the species was made by Prof. C. F. Wheeler, of the Agricultural College of Michigan.—Alice Eastwood.

Mr. Hendrie's Gifts to the California Academy of Sciences.—The library of the Academy of Sciences has recently been enriched by the addition of the Botanical Register. This rare set of fine books, numbering thirty-three volumes, is the gift of Mr. J. W. Hendrie, a member of the Academy for many years. Mr. Hendrie is the generous friend of the Academy, who recently presented the institution with securities amounting to a value of about ten thousand dollars. These have been made the basis of a publication-fund, to be known as the Hendrie Publication Fund, the interest of which is to be used for the scientific publications of the Academy.—Alice Eastwood.

NEWS NOTES AND CURRENT COMMENT.

Prof. Chas. V. Piper, who has been for several years actively engaged in the collection and study of the Washington flora, has been granted a year's leave of absence by the trustees of the Washington Agricultural College, for investigation of the plants of that state. His present address is the Gray Herbarium, Harvard University.

Dr. A. A. Tyler, formerly of Union College and Syracuse University, has been elected Assistant Botanist at the University of Arizona. Prof. W. J. Toumey, the Botanist at that place, will during the current college-year spend one-half of his time in Washington as a member of the Division of Forestry staff.

We have received a new edition of the "Essentials of Vegetable Pharmacognosy," under the title of "Morphology and Histology of Plants." Part I, by Dr. H. H. Rusby, relates to the morphology of plants; Part II, by Dr. S. E. Jeliffe, relates to plant histology. This edition is very much enlarged and improved and we hope to notice it further in a future issue of this Journal. [Published by the authors, College of Pharmacy of the City of New York.]

Contributions from the U. S. National Herbarium, Vol. V, No. 4, bespeaks the scientific activity of Mr. J. N. Rose, Assistant Curator, Division of Plants. The greater part of this number is devoted to "Studies of Mexican and Central American Plants" and particularly to a paper entitled "Notes on Useful Plants of Mexico;" the result of observations made by the author while traveling in Mexico in 1897. The food plants universally used are Indian Corn, Red Peppers, Tomatoes, and Beans. The Pulque Plant or Maguey (Agave atrovirens) is illustrated by reproductions of some fine photographs, as also a number of fiber plants, native tools used in extracting the fiber, and specimens of fiber products.

Under the title of "New Plants from Wyoming," Prof. Aven Nelson has contributed some five papers since the beginning of the year to the pages of the *Bulletin of the Torrey Club*. The reprints of No. VII, furnished to the author for distribution, by the

Bulletin, are not dated, nor is there any indication of their origin. Ordinarily the name of a journal and the title of an article alternate regularly in the running head, but in recent issues of the *Bulletin* the title of the article appears at the top of both odd and even numbered pages and the name of the *Bulletin* does not appear at all. In consequence the origin of such a reprint as that before us is quite untraceable.

The season of 1897–98 was, in California, one of such scanty rainfall during the winter season that the period was one of grave anxiety. The fear that the season of 1898–99 was to be a complete repetition of the year before was in the end happily dissipated, but in each of these years the long rainless (or summer) season witnessed widespread and disastrous fires in the forests and mountainous country, accompanied by the exhaustion of flowing springs and wells, and the drying up of hitherto perennial streams. On account of the drought and lack of range-feed in certain drier portions of the state, cattle died upon a thousand hills, or, in the case of other herds, their owners secured their transportation by rail to the humid north Coast-Ranges. As a result, such matters as the larger problems of irrigation, the storage of flood-waters, and, as a necessary consequence, forest-protection and reforestation of denuded areas, has been brought very near home to many classes of people.

The friends of the forests were not, at such a juncture, slow to take advantage of the situation; they have sounded right vigorous alarms in many quarters; literature has been distributed; resolutions have been drafted; state water and forest societies have been formed; and in the editorial columns of some of the large daily journals of San Francisco and Los Angeles, as well as in the lesser newspapers of the interior, the subject of forests and forest conservation has been granted an extraordinary amount of space, and has been handled (for daily journalism) with a great deal of knowledge and considerable skill. In the case of one man, they appealed to his material interests; for another they interpreted the seven lean ears and the seven lean kine (of the dream of Pharaoh) as the want and necessity that fell upon the land when the water failed.

THERE ARE many thoughtful people in the state of California, and, indeed, throughout the Pacific states, who at this time are desirous of intelligent information about the forests and about forestry, and of the sort that is not too technical to be, to them, intelligible. Very opportune, therefore, is a little volume of eighty-eight pages, entitled, "A Primer of Forestry, Part I," which has just been published by the United States Department of Agriculture. Its author is Mr. Gifford Pinchot, chief of the Division of Forestry of the Department. His style is popular but lucid, and the "Primer" will answer those questions which are most generally asked about the meaning of forestry and its aims. Chapter I is concerned with the individual tree, its parts, food, and growth. Chapter II discusses trees in the forest; Chapter III, the life of a forest; and Chapter IV, the enemies of a forest. The book is, as a book for popular instruction on this subject should be, copiously illustrated.

BULLETIN 64 of the South Dakota Agricultural College is a catalogue of the ferns and flowering plants of South Dakota, by D. A. Saunders. The list is chiefly distinguished for its peculiar nomenclature, which is unvexed by adherence to any generally accepted system of orthography. There are many curious combinations and adjectival, geographical, and personal names are indifferently capitalized or decapitalized. "Apois apois" is a novelty, and so is also "Silena antirrhina," and "Silena Noctiflora." Capitalization is denied the specific part of "Anemone virginiana," but the specific part of "Anemone Canadensis" stands resplendent with a capital C. On adjoining pages we find "Eragrostis purshii" and "Poa Buckleyana," while "Potentilla Hippiana" rejoices in closest proximity to "Potentilla hippiana diffusa." As between "Panicum Capillare," "Ixophorous Virdis," "Muhlenbergia Sylvatica," "Avena Striata," "Pyrolla Elliptica," "Onosmodium Molle," "Malva Sylvestris," etc., on the one hand, and "Thalictrum diocium," "Roripa sinuata," "Steironema ciliaum," and many others on the other hand, the honors seem to be evenly divided. There is a rather elaborate erratum, but examination shows that there is need of an erratum to the erratum. The list was published at Brookings, S. D. We trust that Professor Saunders can prove an alibi.

As long ago as 1880 and 1882 cuttings of the true Smyrna Fig and Caprifig were imported into California and distributed among the leading horticulturists of the state. These grew well and eventually bore figs, but no fruit ever arrived at maturity. The growers came at length to the conclusion, that the wrong variety had been received, and the trees have been generally uprooted. The insect, which accomplished caprification, was not imported, but that the failure was due to this cause, was not understood until the publication of Dr. Gustav Eisen's researches on "Figs, Caprifigs, Caprification." In 1890 Smyrna figs, the first produced in California, ripened at Fresno as a result of artificial pollination. The later Italian students, especially Gasparrini, had concluded as a result of their investigations, that the practise of caprification was wholly legendary and not a necessary operation prerequisite to the development of the fig, although they had unrivaled opportunity for the study of the subject. This fallacy, so widely diffused, was exposed in the paper above quoted, and through the initiative of leading California horticulturists the attention of Secretary Wilson, of the Department of Agriculture, was directed to the necessity of a special investigation of the problem. Mr. Wilson, therefore, in detailing Dr. Walter T. Swingle, of the Bureau of Seed and Plant Introduction, for field-work in the Mediterranean region, included the Fig with the Date and other fruits, which were to be specially studied. Dr. Swingle was given *carte blanche*, and visited Algiers, Italy, and Smyrna in Asia Minor, from which latter place in 1898 he sent male and female individuals of the species of Blastophaga, which does the work of caprification in the Mediterranean country. The first consignment died out, but a later consignment, which was liberated at Fresno in 1899, is thriving, and there is now no doubt of the ultimate establishment of the insect in California. Dr. Swingle arrived in California in the middle of October, for the purpose of spending some weeks studying the conditions here, conferring with the horticultural societies and organizations, and determining the localities best suited to the growth and development of the Fig. The symbiosis existing between the Blastophaga and the Fig is by far the most remarkable and interesting case known to botanists, and the establishment of this interdependent plant and animal in California will be attended with no little scientific interest.

THE BOTANICAL PARTY from the University of California which sailed from San Francisco on June 9 for the Aleutian Islands, arrived at the native village of Iliuliuk, Unalaska Island, June 21. Prof. W. A. Setchell, Dr. W. L. Jepson, Mr. L. E. Hunt, and Mr. A. A. Lawson composed the expedition, the work of which was greatly advanced through the kindness of the Alaska Commercial Company, whose officers aided the scientists in every way. Mr. N. Gray, the agent at the Alaska Company's Unalaska post, placed at the disposal of the party a furnished house, which was appreciated both for the living comforts and the facilities for preliminary laboratory studies and the drying of specimens which it afforded. On the Island of Unalaska, one of the largest of the Aleutian chain, work was carried on for eight weeks: all forms of plant life were studied; records of observations were made; and as complete series of specimens as it was possible to prepare were the subjects of preservation. Professor Setchell's attention was directed primarily to special field-studies of the algæ, particularly the marine algæ, their zonal distribution, the conditions of growth and similar matters. Between sixty and seventy sets of algæ, destined for eventual distribution in the Phycotheca Boreali Americana were collected, in which Professor Setchell was assisted by Mr. Lawson and Mr. Hunt. The work on the seed-plants by Dr. Jepson included the collection of illustrative specimens, observations upon dominating plant forms, studies of the composition and character of plant communities, and notes on general and altitudinal distribution. In this work he was assisted by all members of the party. The general results, moreover, will be enhanced by the determinations of altitudes and by the excellent series of photographs made by Mr. L. E. Hunt, of the Department of Civil Engineering of the University of California, who volunteered his services for the expedition. During three of the eight weeks spent on the shores of Bering Sea, Professor Setchell made a trip to St. Michael and Cape Nome, where he made a full collection, consisting chiefly of flowering plants and lichens. This trip was made possible through the courtesy of Captain Pratt, of the U. S. Coast and Geodetic Survey steamer *Patterson*. On the homeward journey the distribution of plants along the Alaskan Coast line was an object of especial interest, collections being made at all points where opportunity offered, including Unga, Karluk, Uyak Bay,

Kodiak, Prince Williams Sound, Juneau, and Sitka. The party arrived in San Francisco September 14, after most successful three months' journeying. In preparing for the expedition during the six months preceding the departure of it, the members of the party derived invaluable personal assistance from Dr. Geo. Davidson, Professor of Geography in the University of California, and formerly assistant in the Geodetic Survey on the Pacific Coast, who possesses most extensive and accurate knowledge of the waters and coasts of Bering Sea. Acknowledgment is also due to the Alaska Commercial Company, to the Pacific Steam Whaling Company, to Captain Downing and Purser Christian, and to the Pacific Coast Steamship Company. But for the courtesies extended by these companies the expedition would scarcely have been undertaken.

Mr. Grant Allen, who died recently in London, was born in Canada, educated at Oxford, and appointed principal of the Government College in Jamaica, but spent the greater part of his life in England. He was a most versatile writer and became known to all English-speaking botanists. His popular botanical productions, while often devoid of scientific caution and thus exciting the London botanical critic militant, were, nevertheless, vivid and picturesque and very frequently highly suggestive in character. It may surprise many to learn of the range of his activity. He was not only an enthusiastic naturalist but an author of sensational novels and of a continental guide-book, a Radical pamphleteer, a writer of short stories about African millionaires and similar kindred subjects, and he recently issued an edition of White's Selborne. Evolution, however, was his favorite topic, and, whatever else may be said of him, capable judges agree that he has done more than any other contemporary Englishman to popularize in a most lucid manner the work of Huxley and of Darwin.

During colonial days and the early part of the century, Philadelphia enjoyed the distinction of being the leading scientific city in America, a prestige which, although lost at a later time, accounts for the long roll of botanists in Dr. Harshberger's thick volume, "The Botanists of Philadelphia and Their Work," a title which is made to include Pursh, Nuttall, Rafinesque, and other natu-

ralists who for a time resided in the Quaker City. This recently-issued book is a handsome volume, and is beautifully illustrated with views of Bartram's house and botanical garden, with portraits of Muhlenberg, Nuttall, and others down to the present day. Of these, Bartram (1699–1777) is above all others the father of Philadelphia botanists. He was a native of Pennsylvania, a friend of Franklin and of Washington, a "lover of justice, truth and charity," an original member of the American Philosophical Society, and was, as a botanist should be, a great traveler. In the sketch of his life and account of his travels is found the expression of his unfulfilled desire to explore the Mississippi Valley, out of which grew the idea of definite exploration of the mysterious country which stretched beyond. Bartram's influence as a man could by no means have been inconsiderable. It is related that President Jefferson's instructions to the leaders of the Lewis and Clarke expedition read like extracts from Bartram's letters. [This book may be had of J. W. Harshberger, University of Pennsylvania, Philadelphia.]

A NUMBER of botanical expeditions to various parts of California were undertaken during the summer vacation by instructors and students of the University of California, all of which returned with specimens for the enrichment of the research material of the University. A study of the economic plants, especial attention being paid to the grasses, was made by Mr. J. B. Davy, Assistant in Botany, on a two months' journey in the coast region from Ukiah northward to Crescent City. He was accompanied by Mr. W. C. Blasdale, Instructer in Chemistry, who gathered fungi. Mr. C. P. Nott, Assistant in Botany, collected algæ in the tidal marshes about San Francisco Bay, and Mr. H. T. A. Hus, a graduate student, made similar collections at the Farallone Islands and in Marin County. Mr. M. S. Baker, a non-resident graduate student, botanized in Sonoma County and in the little-known Modoc lava-bed region of northeastern California. Mr. H. M. Hall, class of 1901, visited again the San Jacinto Mountains of Southern California, where he has discovered many novelties, and of which he has been the only botanical explorer. Mr. H. P. Chandler, class of 1902, made a collection of two hundred carefully-prepared

plants in the Pajaro Hills, Monterey County, a region historically interesting but somewhat neglected in these later years.

Mr. J. M. Greenman, assistant in the Gray Herbarium of Harvard University, is at present studying in Germany. His address is the Konigliches Botanisches Museum, Berlin.

A report upon the "Algæ of the Pribilof Islands" by Prof. W. A. Setchell may be found in Part III of "The Fur Seals and Fur-Seal Islands of the North Pacific Ocean." A plate of Laminaria longpipes accompanies the report and about thirty-eight species are listed. Algologists will be interested in learning that the results of Professor Setchell's studies upon the thermal algæ of the Yellowstone National Park are now in such form that their publication is likely to be more or less immediate.

By reason of somewhat prolonged absence from Berkeley on the part of the Editor of this Journal, a goodly number of papers and new books have failed to receive notice in these columns. Such will, in so far as possible, be given attention in the December number.

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WILLIS LINN JEPSON,

Assistant Professor of Botany, University of California.

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NEW AND NOTEWORTHY NORTHWESTERN PLANTS.—II.

By C. V. Piper.

Mitella trifida Graham and its allies.

In endeavoring to identify two very different northwestern Mitellas, both of which had been referred to *M. trifida* Graham, a rather curious confusion was brought to light. Excepting *M. pentandra* Hooker, *M. caulescens* Nutt., *M. Breweri* Gray, and the recently described *M. violacea* Rydberg, all of our western species have at one time or another been referred to *M. trifida*. One reason for this seems to have been the fact that no authentic specimens of *M. trifida* existed in American herbaria, and only recently has the plant again been collected. At any rate, *M. trifida* has been made to include all the species except those mentioned above, and as thus constituted was an aggregate of no less than seven species.

Of these seven, *M. ovalis* Greene, Pitt. I. 32 (1887) (M. Hallii Howell, Erythea, III 33, 1895) is closely related to *M. Breweri* Gray, and it will form the second species of the § Brewerimitella Engler.

The other six seem truly allied to *M. trifida*, which is the type of the § Mitellina Meisn. The new species here described, however, require some changes in the generic description as well as in the § Mitellina, which may be thus characterized: Calyx-lobes erect or little spreading, thin and petaloid, about equaling the campanulate or funnel-form tube; petals entire or wanting or more or less 3-cleft or parted; stigma 2-lobed.

The following key will serve to separate the species. The types of the new ones here described are in the Gray Herbarium.

KEY TO THE SPECIES.

* Flowers with petals.

+– Calyx-lobes 3-nerved, the mid-nerve branched, the lateral ones simple; plants rather small, the inflorescence less than 6-cm. long.

*

++ Petals elongate-cuneate, acutely trifid, the subequal lobes one-third the length of the petals, these twice as long as the calyx-lobes ..... 1. *trifida* Graham

++ ++ Petals oblanceolate, entire or slightly cleft into short unequal lobes, little exceeding the calyx-lobes.....2. *violacea* Rydberg

+– +– Calyx-lobes 3-nerved, the midnerve simple, the lateral ones branched on the outer side or rarely simple; plants larger, the inflorescence 6–12 cm. long.

++ Calyx-lobes obtuse, not mucronate; petals entire or parted into filiform lobes; leaves reniform-orbicular, not angularly lobed.

= Petals deeply 3-parted into filiform lobes; flowers 4 mm. long..... 3. *stauropetala* n. sp.

= = Petals filiform, 1-nerved and entire, or sometimes parted near the apex into two or three lobes; flowers 2 mm. long...4. *stenopetala* n. sp.

= = = Petals oblanceolate, acuminate, 3-nerved in the widest part, entire; flowers 1.5 mm. long .....5. *micrantha* n. sp.

++ ++ Calyx-lobes acute, mucronate; petals palmately cleft at apex; leaves angularly lobed .....6. *diversiloba* Greene

* * Flowers apetalous; petaloid staminodia sometimes replacing the stamens.....7. *anomala* n. sp.

MITELLA TRIFIDA Graham, Edinb. New Phil. Journ. 185, June, 1829. The type of this species was raised in the Edinburgh Botanic Garden from seed collected by Drummond in "Alpine rivulets, north of Smoky River, on the east side of the Rocky Mts., rare." Graham's description is given in considerable detail, and the following recent collections answer to it perfectly excepting that the calyx-lobes are not reddish, viz.: WASHINGTON, Goat Mts., *Allen*, No. 195, July 2, 1895; Mt. Rainier, *Allen*, No. 7, July 20, 1892; Olympic Mts., *Flett*, No. 83; Mt. Baker, *Flett*, No. 858; and a doubtful fruiting specimen, West Klickitat Co., *Suksdorf*, No. 122.

MITELLA VIOLACEA Rydberg, Bull. Torr. Bot. Club, xxiv, 248. In this species the venation of the calyx-lobes corresponds to that of *M. trifida*, the midnerve being branched, the lateral ones simple. The violet coloration of the calyx-lobes and petals is not a constant character even in the type specimens. Exactly the same thing occurs also in M. stauropetala.

The plant appears to be known only from the type collection, Little Belt Mts., Montana, *Flodman*.

Mitella stauropetala. Scapes naked, 3–5 dm. high, slender, sparsely pubescent below, minutely glandular-puberulent above; leaves orbicular, indistinctly 5-lobed, simply or doubly crenate but not strongly so, reniform with the sinus narrow or even closed, sparsely pilose on each surface and ciliate with reddish or white hairs; raceme 6–12 cm. long, 10–25 flowered, strictly secund; flowers white, sometimes violet-tinged, sessile or nearly so, evenly scattered, spreading in anthesis but tending to become erect in fruit, 4–5 cm. long; calyx-lobes erect, oblong-obovate, faintly crenulate, about equaling the funnel-form tube, 3-nerved; the midnerve simple, the lateral ones with 4–6 branches, the lower of these again branched; petals nearly twice as long as the calyx-lobes, filiform, 3-parted nearly half their length into linear lobes, the lateral lobes divaricate; stamens short and included.

Common in the wooded regions of North Idaho; also in southwest Oregon. Specimens examined: IDAHO, Nez Perces County, Craig Mts., *Sandberg, McDougal and Heller*, No. 232 (type); Little Potlatch River, No. 380 of the same collectors; Clearwater River, *Spaulding;* Idaho County, below the Lo Lo Divide, *Watson*, No. 136, Aug. 20, 1880; Latah County, Cedar Mts., *Piper*, No. 1498; Kootenai County, Pen d' Oreille River, *Lyall* in 1861. OREGON, Cascade Mts., southwest Oregon, *Newberry*.

The plant of Douglas, "plentiful in woody situations on the low ridge of the Blue Mts. of Lewis and Clarke's [Snake] River, west of the Rocky Mts., in lat. 46°," referred by Hooker, Fl. Bor. Am. I. 241, to *M. trifida*, is with scarcely a doubt the species here described. Douglas' journal shows clearly that the above locality is what is now known as the Craig Mts., Idaho, the type locality of our species.

Mitella stenopetala. Scapes slender, naked, 3–5 dm. high, minutely puberulent: leaves orbicular, obscurely 5-lobed, reniform with a broad sinus, very minutely puberulent on each side, sparsely ciliate, 2–5 cm. in diameter; petioles 2–3 times as long as the blade, puberulent: raceme secund, bearing 15–20 evenly scattered flowers: flowers white, 2 mm. long, spreading on short petioles: calyx-lobes oblong, obtuse, 3-nerved, the midnerve simple, the lateral with

usually a single branch, equaling the campanulate tube: petals filiform, 1-nerved, entire, or very rarely parted near the apex into two or three lobes, slightly longer than the calyx: stamens 5, very short.

Wahsatch Mts., North Utah, alt. 5,000 ft., *Watson*, No. 365, May, 1869.

Var. Parryi. Smaller in every way than the species: scapes 2–3 dm. high, slender: leaves 2 cm. in diameter, darkly and conspicuously crenate, sparsely pilose; petioles short, pilose: petals more frequently parted at apex: WYOMING, Striking Water, *Parry*, No. 102, in 1873 (type); COLORADO, Trappers' Lake, alt. 9,500 ft., *Crandall*, Aug. 13, 1894.

Mitella micrantha. Scapes stoutish, flexuous, 1.5–4 dm. high, sparsely pubescent below, glandular puberulent above: leaves ovate or orbicular, reniform, usually quite prominently 5-lobed, faintly crenate, glabrous or sparsely pilose on each side, ciliate with scattered hairs, 2–6 cm. long, thickish; petioles twice as long, glabrous or pilose: raceme 2–10 cm. long, the flowers irregularly scattered, not secund: flowers 6–15, whitish, nearly sessile, ascending, 1.5 mm. long: calyx-lobes oblong, obtuse, 3-nerved, the nerves all simple, the lobes equaling the campanulate tube: petals oblanceolate, entire, acuminate, 3-nerved in the widest part, exceeding the calyx-lobes: stamens short, included.

Fort Colville, Washington, *Watson*, No. 135, Sept. 29, 1880.

Mitella diversiloba, Greene, Pitt. I. 32. In addition to the characters in the original description, the following additional ones appear noteworthy: calyx-lobes acute, mucronate, the midnerve simple, the lateral ones branched: petioles incurved: flowers not secund, 2 mm. long: scape usually naked, but sometimes bearing a single leaf near the base.

We have not seen the type, but the species would seem unmistakable in its peculiar foliage, as well as the floral characters. Specimens examined: N. W. CALIFORNIA, *Rattan*, in 1879; WASHINGTON, White Salmon River, *Suksdorf*, No. 13, 21 May, 1881.

Mitella anomala. Scapes naked, slender, 3–4 dm. high, minutely puberulent: leaves orbicular, 5-veined, scarcely lobed, reniform with a broad sinus, doubly crenate, sparsely pilose above, glabrous beneath, ciliate, 2–4 cm. broad; petioles slender, glabrous, or

H. G. Bloomer.

retrorsely pilose above, 8–10 cm. long: raceme 6–12 flowered, not secund: flowers whitish, 2 mm. long, sessile, spreading: calyx-lobes acutish, 3-nerved, the midnerve branched, the lateral ones simple: petals wanting: stamens short, included, or replaced by staminodia, these elongate-cuneate, palmately and acutely 3–5 cleft, incurved, exceeding the calyx-lobes.

Mountains near Yreka, California, Greene, No. 906, 30 June, 1876. The material at hand of this curious species is, unfortunately, rather scanty. The flowers we examined were apetalous in all cases, either with normal stamens or with two or more of them replaced by the petal-like staminodia.

BIOGRAPHICAL SKETCH OF H. G. BLOOMER.

By Willis L. Jepson.

In turning over the pages of books of botany in the library of the California Academy of Sciences which relate in greater or less part to the West American flora, one occasionally finds on the inside of the cover or fly-leaf of the older volumes the name of the donor in an old-fashioned hand. Some of these books were the gift of Hiram G. Bloomer, and are of the kind that are now rare and difficult to obtain, including a few that deserve the name of botanical classics. If one be a student of botany, and given to consulting the herbarium, one finds here, moreover, botanical specimens collected by him with the label not rarely in his hand. Such specimens are only occasionally discovered, however, since by some serious mischance[1] a large number of the specimens of early days cited in the descriptions have been dissipated. In any event, Mr. Bloomer

[1] Mr. H. R. Bloomer, an artist of the Bohemian Club, writes me that his father's herbarium of many thousand specimens, which were classified and arranged in a very thorough manner, was presented to the Academy a year or so before his death. That his herbarium, however, was not acquired by the Academy until after his death seems more in consonance with the records of that institution. At the Academy his herbarium is said to have been lost; nothing remains but a beautifully written and arranged catalogue of it, the work of Mr. Bloomer himself.

bought books (which he afterward donated to the Academy),[2] and collected and studied plants (which he gave to the Academy's Herbarium),[3] but, outside of a short note in defense of the priority of the work of his friends, Drs. Kellogg and Behr, on the Big Trees (Sequoia gigantea), it does not transpire that he ever appeared in print; whereupon we find ourselves confessing some interest in his history and personality.

The botanist who nowadays does not publish few or many research papers in more or less elaborate form is *rara avis;* some there are, indeed, who do not publish, but if one be well acquainted with all the dark corners and shelves of botanical literature, evidences of early indiscretion are likely to be brought to the light and testify against them. But Mr. Bloomer's record, saving for the short note mentioned, is, we believe—and the reader may note our caution—quite spotless; he belonged, we have reason to think, to the Most Estimable Guild of Non-Writers.

But he found work to his hand; he attended with great regularity the meetings of the Academy of Natural Sciences (as it was then styled) from the earliest days of its organization, when scarce a dozen members (nearly the total enrolment) came to its meetings, in

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[2] Minutes of the proceedings run something like this:—Oct. 13, 1854.—H. G. Bloomer presented the 3d vol. of London's Arboretum et Fruticetum. Jan. 15. 1855.—Mr. H. G. Bloomer presented five volumes of the Edinburgh Encyclopedia. Feb. 2, 1863.—Vols. 1 to 27 of the Edinburgh Philosophical Journal, etc.

Every botanist is acquainted with the annoyance attending consultation of and reference to the botanical papers in the Pacific Railroad Survey Reports. There is a volume in the Library of the Academy containing only the botanical papers of the survey, which was the handicraft of Bloomer, and is an excellent example of his systematic and careful work.

For the whole volume he contrived a generic and specific index, which is of an extremely useful nature. All of the papers were repaged in sequence. The first column on an index page refers to the repagination, the other columns cite the original pagination, with the name of the expedition; for example, Pope's, as commonly quoted. There is a similar index to the plates.

[3] Nov. 19, 1855, appears the interesting record: "From H. G. Bloomer, a cone of Taxodium giganteum [Big Tree]." At the next meeting: "From Mr. Bloomer, several hundred specimens of California plants," will serve to illustrate the character of his series of donations.

the old quarters on Clay Street; he took part in its discussions; he occasionally lectured before it; and, at odd times, he did duty as a presiding officer. On Jan. 4, 1858, he was elected to be Curator in Botany, and reelected annually from 1859 to 1862. In 1868 he was elected Director of the Museum, and served until 1873.

The subject of of our sketch was the friend of the gentle Kellogg, and that pioneer physician and botanist at an early date expressed his appreciation of Bloomer's devotion to natural history by dedicating to him the Liliaceous genus Bloomeria,[4] consisting of a single species, B. aurea, collected by Dr. J. A. Veatch at New Idria, and for some time cultivated[5] by the Curator in Botany.

After his death, Dr. Watson, in the second volume of the Botany of California, dedicated to his memory Ranunculus Bloomeri, a plant very characteristic of the lowlands about San Francisco Bay, and an excellent species.

Of details of his life—dates and incidents—we know little. The influx of immigrants from the eastern United States in the early fifties brought many to California from New York State, a noticeably large proportion of whom were afterward to take an active part in state, municipal, and local affairs, and deserve well to be called broad-gauge citizens. Mr. Bloomer was one of these. His birthplace was at Marlborough, on the Hudson, and he received his education at Newburgh College. The gold excitement of 1848 started him on the journey to California in 1849, when he was twenty-eight years of age, but he was taken ill on the Isthmus of Panama, and returned home to New York City. The next year he once more departed for the Pacific Coast, and arrived in San Francisco sometime in 1850. He took part in the stirring events of early days; was a member of that celebrated popular tribunal, the "Committee of Vigilance," and of the Fire-Department, was active in the Lincoln campaign, and had many similar interests. On the scientific side there is one fact to be recorded in addition to what has been written, and which was of great significance, and had in the end far-reaching consequences. This relates to James Lick. Mr. Bloomer was the first to interest Mr. Lick in the nature and

[4] Proc. Cal. Acad., ii, p. 11, illustrated by a plate.

[5] Mr. Bloomer zealously cultivated the native species of Liliaceæ.

extent of scientific work, to explain the needs of its devotees, and to introduce him to the Academy.

Bloomer's love for botany, which dated from childhood, indirectly led to his death. While on an exploring trip in Marin County, with several fellow-scientists, the party lost their way and were compelled to pass the night in the open air. On account of over-exertion and exposure Mr. Bloomer died shortly afterwards. This event was in September of the year 1874. So passed away a man, who worked with untiring energy for natural science and civic welfare, but withal so modestly, that little record has been left to speak of what he accomplished.

SOME NEW WESTERN SPECIES.

By Elias Nelson.

Besides the well-known *Valeriana edulis* there are four other valerians in Wyoming which are quite distinct. One of these is the so-called *V. sylvatica* of the Rocky Mountains. Another is doubtfully referred to the northern *V. Sitchensis*. Two are undescribed, and these I here propose as new species.

Valeriana micrantha. Stems erect, solitary, from a creeping rootstock, glabrous or nearly so; leaves glabrous; the radical entire or with 1–2 pairs of small rotund to oblong-ovate lobes on the somewhat pubescent petiole, which is 7–20 cm. long, ovate to elliptic, 3–7 cm. long; the cauline 2 pairs, rarely 3, short-petioled or sessile, with 2–3 pairs of elliptic to lanceolate leaflets; inflorescence numerously flowered, not very much contracted at anthesis, in fruit open, the cyme broader or as broad as high, usually a pair of cymules at the third node of the stem, these about 15 cm. distant from the next pair; corolla white, broadly campanulate, 2–3 mm. long (in type barely 2 mm.); the tube proper exceedingly short, the throat hairy within; stigma 3-cleft or entire; achenes narrowly ovate, pubescent, 3–4 mm. long.

This excellent species is distinguished from *V. sylvatica* by its

minute, white, almost tubeless corolla, which is not gibbous at base, and by its narrower pubescent achenes. It has been distributed as *V. Sitchensis*, the difference between it and the Rocky Mountain form of *V. sylvatica* being so evident that it has not been associated with that.

The types of this, as well as those of the following species, are deposited in the Rocky Mountain Herbarium, at the University of Wyoming. The following are the collections of this species: No. 793 (type), Wind River, Aug. 10, 1894, Aven Nelson; No. 4203, Battle Lake, Aug. 17, 1897, Aven Nelson; Freezeout Hills, July 11, 1898, by the writer.

Valeriana Wyomingensis. Stems weak and slender, several from a creeping branched rootstock, 3–5 dm. high; glabrous except for a little pubescence at the base of the petioles; radical leaves all entire, with undulate margins, as also the terminal leaflet of the cauline, 1–5 cm. long; the earlier rotund or obovate, with short, broad petioles; cauline leaves 2 pairs, pinnate or the lower pair rarely entire; leaflets 1–3 pairs, small, oblong to lanceolate, the uppermost pair not infrequently confluent with the much larger terminal leaflet; inflorescence a cymose panicle, very loose and open even at anthesis, few-flowered, composed of 7–15-flowered cymules; corolla campanulate, white, 2–3 mm. long; tube proper very short; throat hairy within; lobes recurved; stigma minutely 3-cleft; achenes lanceolate, glabrous, about 5 mm. long.

Related to the preceding, but a more delicate plant. Its achenes differ from those of *V. micrantha* in being glabrous, and from those of *V. sylvatica* in being lanceolate, while the inflorescence is fewer flowered than in the former, and much more open than in the latter.

The type is No. 5686, collected in moist woods, near Undine Falls, in Yellowstone National Park, July 6, 1899.

Phlox Whitedii. Low, suffrutescent; the yearly growths very short, subtended by small scale-like ovate leaves (3–7 mm. long), 5–10 cm. long; the branches of the preceding season giving rise terminally to short leafy-bracted corymbose (about) 9-flowered cymes, or laterally to slender leafy branches, each of these terminating in a fewer-flowered cyme; glandular-pubescent and viscid; leaves of the sterile shoots linear, with slightly thickened and

somewhat scabrous margins, and with a prominent midrib underneath, 12–25 mm. long, 1–2 mm. wide; bracts ovate, lanceolate or linear-attenuate; calyx very viscid, 9 mm. long; the teeth shorter than the tube; corolla bluish, exceeding the calyx by one-third; the lobes narrowly obcordate, 9 mm. long.

When preparing the revision of the Western N. A. Phloxes I referred this to *P. occidentalis* Durand, having then only a small specimen collected by Kirk Whited at Wenatchee, Wash., in 1896, and did not therefore venture to describe it as new. Now that good material is at hand, secured by Mr. Whited in the same locality and communicated by Prof. C. V. Piper, I do not hesitate to name it. I take great pleasure in dedicating it to the collector, whose No. 1036 is the type, and many of whose fine specimens of Phlox I have had occasion to examine.

Saxifraga saximontana. Scapes one or two, from a short rootstock which is covered with numerous fibrous roots, pubescent with short purple-tipped hairs and somewhat glandular, 1–2 dm. high; leaves ovate, rhombic-ovate or oval, with petioles of about their own length, glabrous except the margins, which are often pubescent, some of them often purplish, 10–35 mm. long; inflorescence a panicle of ascending, few-flowered, corymbose cymes; bracts linear or oblong; calyx adnate to the carpels only at the base, inclosed at base in a scarious envelope, divided nearly to the base into ovate, obtuse, at length reflexed, 3-nerved lobes; petals white, short-clawed, rotund to broadly oval, rounded at apex or barely retuse, with several lateral nerves arising near or above the middle, these evanescent or converging to the mid-nerve near the apex, a little less than twice the length of the calyx lobes, 1.5–3 mm. long; filaments about as long as the calyx lobes, clavate; anthers yellow; carpels distinct to the base, ovoid to oblong-ovoid, purple, at length divergent, about 5 mm. long; seeds oblong, low-tuberculate.

Within recent years several relatives of the eastern *S. Virginiensis* have been described from the Pacific Coast states, but the plant of the Rocky Mountains formerly referred to the above, seems to have been overlooked. Of all its western allies the species here named is nearest to *S. Californica.* From that, however, it is readily distinguished by its glabrous, coarsely serrate leaves and

much smaller, clawed petals. Its inflorescence is also of another character, being a panicle of corymbose cymes, while that of *S. Californica* is a cymose panicle of racemes. In *S. Grayana* it seems to have an eastern ally. That, however, is a much larger plant in every way, with a pilose pubescence and narrower petals.

Collected by Aven Nelson at Sundance, Wyo., July 6, 1896, No. 2823. Also secured the past season in the Yellowstone National Park; No. 5917 (type), near Yancey's July 17, 1899; No. 6372, Lewis River, Aug. 9.

Saxifraga subapetala. Scapes solitary, from a thickened, corm-like caudex which is covered with numerous fibrous roots, hirsute, often minutely so, and somewhat glandular, 2–4 dm. high; leaves elliptic to narrowly so or oblanceolate, some of the earlier often oval or rhombic-ovate, gradually narrowed at base into short, broad, margined petioles of less than half their length, obtusish or acute, entire or remotely repand-denticulate, both sides glabrous or sparsely covered with short, crisp hairs, the midrib underneath usually sparsely hirsute, margins fringed with ciliate hairs, 5–10 cm. long; panicle spiciform; the glomerules dense; the bracts linear to lanceolate; flowers subsessile or short-pediceled; calyx tube adnate to the carpels very nearly its whole length, broadly turbinate-campanulate, inclosed in a scarious envelope; calyx lobes a little onger than the tube, broadly ovate, obtuse, longer or as long as broad, 3-nerved, the lateral nerves branched, at length reflexed, 2.5–3 mm. long; petals wanting or present, white or tinged with red, minute, oval, obtuse, not clawed, with two lateral nerves arising just below the middle, these evanescent or converging to the mid-nerve near the apex, 1–2 mm. long; filaments subulate, about half the length of the calyx lobes; anthers red; ovaries with a deep, narrow concavity between them, immersed in a crested-margined disk, this margin persisting at the middle of the mature carpel as an undulate ridge; styles conical; mature carpels distinct, compressed, ovoid, widely divergent at summit, red or purple; seeds elliptic, irregularly wing-margined, short-tuberculate in lines.

This seems to be as good a species as any of the recent segregates of *S. integrifolia.* It is well characterized by the scarious envelope of the calyx, the absence of petals or their minuteness when present, and the undulate ridge of the carpels. It resembles

S. Sierræ, which is perhaps its nearest ally, in its leaves, except that they are not "conspicuously serrate-denticulate." The petals, when present, differ from both those of *S. Sierræ* and of *S. integrifolia* in not exceeding the calyx lobes. They are not retuse, as in the former, nor clawed, as noted by Mr. Howell in his description of *S. Oregana*. There seems to be no mention anywhere of anything like the peculiar carpological character noted above, except in *S. plantaginea*, whose fruits will no doubt be found similar to those of the species here described.

S. integrifolia and its related species are nearly all from the Pacific Coast states, while this species is of the Rocky Mountains, appearing to be quite common in northwestern Wyoming.

The following are the chief collections: No. 5490, Henry Lake, eastern Idaho, June 22, 1899; No. 6089 (type), Obsidian Creek, July 24; No. 5580, Glen Creek, June 30; No. 6687, Dunraven Peak, Aug. 27; the last three numbers all from Yellowstone National Park, 1899.

University of Wyoming,
Laramie, Wyo.

NEW AND NOTEWORTHY NORTHWESTERN PLANTS.—III.

By C. V. Piper.

Spiræa cinerascens. Densely cespitose, the caudex and branches stout; leaves rosulate, spatulate-oblanceolate, entire, obtuse or acutish, 3-nerved, thick and leathery, cinereous, pilose especially on the margin and narrowed base, 1–2.5 cm. long including the petiole, whose dilated base is strigose with white hairs and more or less persistent on the shoots; inflorescence racemose or paniculate; flowering shoots erect, 6–15 cm. high, cinereous-pubescent, with few or rather many acute lanceolate bracts, 5–10 mm. long; pedicels short, 1–4 mm. long; flowers 3 mm. long; calyx-lobes 5, narrowly triangular, acute, 3-nerved, much exceeding the tube, erect and not becoming reflexed; petals 5, narrowly oblong or slightly obovate, obtuse, white, 5-nerved, hardly exceeding the calyx lobes, quite persistent; stamens 15–25, attached to a disk at the base of the calyx lobes; filaments subulate, slightly longer than the petals; carpels 4–7, oblong, sparsely pilose, each tipped with a slender outwardly-bent style, which exceeds it in length; ovules commonly 2; seed 1, lanceolate, acute at each end, the coat becoming mucilaginous when wetted, 2 mm. long; embryo straight.

Collected by A. D. E. Elmer, No. 853, on bluffs of the Columbia River, Wash., 12 miles south of Chelan, in crevices of basaltic rock.

Nearest to S. Hendersoni (Eriogynia Hendersoni Canby), from which it is readily distinguished by its acute calyx lobes, much smaller petals, and peculiar pubescence. From *S. cæspitosa* Nutt. it is at once separated by its 3-nerved leaves and very different pubescence. In developing mucilage from the seed-coat the new species is unique.

The species here described would fall into the genus Eriogynia, as delimited by Dr. Watson, but there is nothing to distinguish his Eriogynia fron Spiræa, except the cespitose habit of the former. Kuntze, followed by Greene, accepts the genus in the Watsonian

sense but uses the generic title Luetkea of Bongard. Focke * retains Eriogynia for E. pectinata Hook, and refers E. cæspitosum Wats. to Spiræa § Petrophytum, the other species, E. uniflora Wats. and E. Hendersoni Canby, being apparently unknown to him. Contrary to the statement of Focke, the carpels of E. pectinata Hook. dehisce on both sutures when fully mature and not on the ventral suture alone, so that Eriogynia can not be upheld by such a distinction. The genus may, however, be maintained in this sense, that is, for the single species *E. pectinata* Hook and characterized by having the stamens united at base, the leaves pectinately trifid and the testa loose and much larger than the embryo, in all which particulars it differs from the remaining species of Eriogynia, Watson, which seem indistinguishable from Spiræa except in habit.

The synonymy of the species above discussed is as follows: *Spiræa cæspitosa* Nutt.; T. and G. Fl. N. Am. I. 418 (1840). *Eriogynia cæspitosa* Watson, Bot. Gaz. XV. 242 (1890). *Luetkea cæspitosa* O. Kuntze. Rev. Gen. Plant, I. 217 (1891).

Spiræa Hendersoni. *Eriogynia Hendersoni* Canby, Bot. Gaz. XVI. 236 (1891). Luetkea Hendersoni Greene, Pittonia II. 219 (1892).

Spiræa uniflora. *Eriogynia uniflora* Watson, Bot. Gaz. XV. 241 (1890). *Luetkea uniflora* O. Kuntze, Rev. Gen. Plant. I. 217 (1891).

Eriogynia pectinata Hooker, Fl. Bor. Am. I. 255 (1833). *Saxifraga pectinata* Pursh, Fl. I. 312 (1814). *Luetkea sibbaldioides* Bongard, Mem. Acad. St. Petersb. Ser. 6; II. 130 (1831?). *Spiræa pectinata* T. and G., Fl. N. A. I. 417 (1840). *Luetkea pectinata* O. Kuntze, Rev. Gen. Plant. I. 217 (1891).

Boykinia major **intermedia.** Whole plant sparsely pubescent with rather long reddish hairs, and more or less glandular, especially above; stems rather slender, erect, striate, 4–5 dm. high; radical leaves 5–9 cm. wide, broader than long, abruptly deltoid at the base, which is not at all reniform, 5 to 7-cleft, the lobes coarsely and somewhat incisely toothed, on stout petioles (with dilated bases) scarcely longer than the blades; cauline, three or four, similar, on shorter petioles, which bear a pair of subrotund entire adnate

*Engler and Prantl, Die. Nat. Pfl, Fam. III. Abt. 3, p. 15.

stipules, 5 mm. long; peduncles slender, axillary from all or nearly all the cauline leaves which they exceed, as well as from the bracts, simple or the lowermost branched, each bearing a cymose cluster of 6–12 flowers; calyx 4 mm. long, the attenuate triangular lobes as long as the campanulate tube; petals white, broadly spatulate, or obovate, 4 mm. long.

Collected by F. H. Lamb, No. 1267, at New London, Chehalis County, Wash., 10 June, 1897.

I have considerable hesitancy in describing this plant even as a variety, but its habital characters are so different from typical *B. major* Gray as to merit attention. The principal differences are the smaller flowers on axillary peduncles and the smaller leaves which are not reniform at all. The whole aspect of the plant is very similar to *B. occidentalis* T. and G., which suggests a possible hybrid origin.

Rudbeckia alpicola. Stems stout, 1–2 meters high, striate, glabrous below, sparsely pilose above with short white hairs; leaves broadly ovate in outline, sessile or nearly so, rather harshly pubescent on each side, 12–20 cm. long, all but the uppermost pinnately 3 to 5-parted, the lateral lobes lanceolate, the terminal one ovate and much larger, all sparingly dentate with larger teeth; head single, rayless, in fruit 6–8 cm. long; involucre consisting of about 20 bracts, these green, lanceolate, acute, 3 cm. long; disk cylindrical; chaff-scales boat-shaped, pubescent at apex, slightly longer than the achenes; achenes 4-angled, 5 mm. long, with a four-toothed pappus, which is not at all or only very slightly coroniform.

Mt. Stuart, Kittitas County, Wash., July, 1898, A. D. E. Elmer, No. 1171, at about 4,000 feet altitude.

Nearest *R. montana* Gray, from which it differs principally in its achenes, and its foliage, which is pubescent but not at all glaucous. In some respects the plant is intermediate between *R. montana* Gray and *R. occidentalis* Nutt.

Senecio Elmeri. Perennial, with horizontal creeping rootstocks, forming rather dense mats; whole plant early glabrate by the disappearance of a white tomentum, this most persistent on the involucre; upright shoots 12–20 cm. high, nearly equaled by the leaves; radical leaves spatulate-oblanceolate, mostly obtuse, rather thickish, saliently and somewhat unequally dentate, the blades 3–6

cm. long, equaled by the margined petioles; cauline similar, usually two, the upper sessile or nearly so; inflorescence of a few heads on peduncles 2–4 cm. long, borne in the axils of lanceolate bracts, or the lowest head in the axil of the upper leaf; heads 1 cm. high, about 20-flowered; involucre of about 8 bracts, these lanceolate, obtuse, 10 mm. long, with scarious margins as broad as the green central portions; rays few, 5 mm. long; achenes glabrous; pappus white, equaling the corollas of the disk flowers; style-tips truncate, margined with short glandular hairs.

Collected by A. D. E. Elmer, No. 715, on gravelly moraines at the head of North Fork of Bridge Creek, Okanogan County, Wash., September, 1897.

One of the Senecio lugens group, well characterized by its cespitose habit as well as in technical characters.

Polemonium amœnum. Perennial, erect, or nearly so, 4–6 dm. high, glabrous below, sparsely viscid-puberulent above; stems terete, slightly wing-margined; cauline leaves 4 or 5, 15 cm. long; leaflets 15–21, lanceolate, sessile, attenuately acute, 2–3 cm. long; inflorescence leafy-bracteate, open, the flowers in clusters of 2–4 on slender peduncles; bracts 3 to 9-foliolate; calyx deeply 5-cleft, 1 cm. long, viscid-pilose, the narrow, acute lobes about twice as long as the tube; corolla pale blue, 1.5 cm. long, the broad obtuse lobes exceeding the tube; filaments dilated at base, pilose-appendaged; style 3-cleft at apex, included; seeds 3–4 in each cell.

Humptulips, Chehalis County, Wash., F. H. Lamb, No. 1178, 11 June, 1897.

Nearest to P. carneum Gray, from which it differs in its smaller blue flowers and more numerous narrower leaflets.

SHORT ARTICLES.

Epitaph of David Douglas.—Upon either side of the doorway or entrance to the Kawaiahao Church in Honolulu the passer-by may see a tablet set in the wall. One of these is in commemoration of David Douglas, the botanical explorer, who met, after leaving California, a tragic death on one of the Hawaiian Islands. The inscription upon the tablet reads as follows:—

Hic iacet
D. David Douglas,
Scotia anno 1799 natus:
qui
indefessus viator,
a Londinensi Regia Societate
Horticulturali missus,
in Hawaii saltibus,
die 12^us^ Julii A. D. 1834
victima scientiae
interiit.

Sunt lacrymae rerum, et mentem mortalia tangunt.
Verg.

For the above transcription I am indebted to Dr. E. E. Brown, Professor of Pedagogy in the University of California, who visited the Hawaiian Islands in the summer of 1898.

Douglas as a traveler was distinguished both for his sagacity and his undaunted courage. The narrative of his expeditions in the unexplored regions of western America possesses all the charm of romantic adventure. So widely read is the life-story of this hardy explorer, that I am sure the publication of the above lines from the tablet will be received with interest.—W. L. Jepson.

Migratory Plants in Alameda County.—While looking for specimens of *Suaeda Californica* Watson, recently, on the marsh between Oakland and the mole, I discovered *Dicentra chrysantha* H. and A., *Trichostema lanceolatum* Benth., and *Chrysopsis rudis* Greene, growing along the narrow-gauge railroad track. These plants are out of their usual range and habitat. They have evidently started out on a tramp existence and have, like many other plants, chosen the highway frequented also by tramps of the human species.

It may be interesting to note the other plants found within an area of a few square yards: Suaeda Californica Watson; Frankenia grandifolia Ch. and Schl.; Spartina stricta var. (unpublished variety of Scribner); Solanum nigrum L. (a form with tiny white flowers and black berries as large as peas); Rumex salicifolius Weinm.;

Artemisia biennis Willd; Artemisia heterophylla Nutt.; Spergularia salina Presl. (the form which Greene has described as Tissa salina sordida); Polygonum lapathifolium nodosum Small; Juamea carnosa Gray; Cuscuta salina Engelm. (parasitic on the preceding and the following); Salicornia ambigua Michx; Plantago major L.; Atriplex patula hastata Gray; Statice Limonium Californica Watson; Hemizonia luzulæfolia lutescens Greene.—ALICE EASTWOOD.

ANOTHER INTRODUCED PLANT.—The students in the High School at Santa Maria, California, have sent to the Herbarium of the Academy of Sciences specimens of Linaria reticulata var. aurea-purpurea. They found this showy species abundant in the cultivated fields around Santa Maria and apparently spreading rapidly. This marks probably the introduction of a new weed, a native of Portugal, and perhaps an escape from the garden of some Portuguese.—ALICE EASTWOOD.

PICEA BREWERIANA.—In the summer of 1898 I visited the station for this tree recorded in this Journal, vol. VI, p. 12. The elevation of the peak there described is about 8,000 feet, and several hundred specimens are to be found growing near the summit. The trunks were 16 to 20 inches in diameter at 2 or 3 feet from the ground and there were plenty of cones in the tops of the trees, which were about 80 feet high. The locality is 80 miles west of Mt. Shasta.—F. M. ANDERSON.

REVIEWS AND CRITICISMS.

California Plants in Their Homes. By ALICE MERRITT DAVIDSON, formerly Teacher of Botany in the State Normal School, Los Angeles, California. [B. R. Baumgardt & Co., Los Angeles.]

In the name of botany many things are perpetrated in the form of "popular" magazine-articles and "popular" books, but no one, who knows Californian plants in the field, or, as Mrs. Davidson says, in their homes, can fail to appreciate those qualities which, we feel certain, will make this book, the first to be written for California,

acceptable both to those botanists, who are critical, and to teachers, who are required or expected to take charge of nature-study in the primary schools. The author's style fits well her subject; she writes most easily and charmingly of "Some Plants that lead easy Lives," "How some Plants begin Life," "Plants that know how to meet Hard Times," "Some Plants that do not make their own Living," "After the Rains," "The Awakening of the Trees," "Plants with Mechanical Genius," "Plants of High Rank," and many such topics. Some of the titles and some of the phrases are indeed, somewhat *Grantallenesque*, but the edged tools of metaphor and of simile Mrs. Davidson handles with considerable caution and judgment.

Although the sub-title reads "A Botanical Reader for Children," the book is more than this, and has something of the character of a manual. The "Supplement for the Use of Teachers," 133 pages, is very full of directions, suggestions, and hints for each of the foregoing chapters. Finally, there is an outline of topics for eight grades. We very much doubt if many teachers will be disposed to take up the study of algæ, oxygen, carbonic acid gas, protoplasm and cell, in the fourth grade, or grant the expediency of such a course, but we have no doubt that the treatment as a whole will be found sufficiently elastic to meet all local needs.—W. L. J.

Plant Relations. A First Book of Botany. By JOHN M. COULTER, Ph. D., Head Professor of Botany in the University of Chicago. [D. Appleton & Co., New York.]

The term "newer botany" is associated in our mind with a certain sort of twaddle in speech and writing; but for this we should like to apply the phrase in its best sense to a bright, vigorous text-book, the best of the year, entitled a "First Book in Botany," by Prof. J. M. Coulter.

Briefly this book is an account of the fundamental characters of plants from the standpoint of general physiology or ecology, and viewing the plant largely as a whole or individual. In the first chapters, however, the leaf, the shoot, and the root are considered separately in relation to the simpler features of structure, of physiology, of light, soil, and other factors, and is followed by an account of reproductive organs, flowers and insects, and of nutrition. In the

chapters on plant societies and the relation of the plant to its environment we are given a most clear and successful presentation of the elements of what is comprised under the new term ecology.

We should expect this First Book to be successful. The theme is not only effectively worked out, but the author begins at the right end of the subject—not only considering the plant as an individual, which is important, but beginning with the highest plants, where may be found examples of correlated differentiation in structure and function which appeal to the natural history instincts of the schoolboy or girl. The compound microscope is in no way essential to good work in botany in the schools.

The illustrations are numerous, including many good photographs. That the camera may be used to illustrate more successfully than the pencil certain classes of subjects, is beginning to be very clear; and rapid progress along this line is doing much for such books as this one before us.—W. L. J.

Sketch of the Evolution of Our Native Fruits. By L. H. Bailey. [MacMillan & Co., New York, $2.00.]

To a certain type of naturalist there is no more pleasing field for study than a country in its primitive condition, inhabited only by plants, wild animals, or aboriginal man. Of the many inquiries which quicken in the mind of a traveler, few are more engaging than those relating to the food products of the savage and the possibilities of the improvement of food plants under the touch of a progressive race. Asa Gray gave expression to a similar line of thought in the following sentence: "It would be curious to speculate as to what our pomology would have been if the civilization from which it, and we ourselves, have sprung, had had its birthplace along the southern shores of our great lakes, the northern of the Gulf of Mexico, and the intervening Mississippi, instead of the Levant, Mesopotamia, and the Nile, and our old world had been open to us as a new world less than four hundred years ago." These suggestive lines appear upon the title-page of Professor Bailey's recent volume, "The Evolution of Our Native Fruits," a volume in which the author has expounded "the progress of evolution in objects which are familiar and which have not been greatly modified by man." The book is given up in great part to accounts

of the origin and progressive differentiation under cultivation of the many berries of the Rosaceæ, of the American grapes, which have given rise to eight hundred varieties, and of the American plums, which have yielded more than two hundred cultivated forms. In addition there is much concerning men—the early horticulturists and cultivators, of whom the author writes as fellow-workers.

The old, old phrase to the effect that of the making of books there is no end, might unguardedly be applied to Professor Bailey alone. Of his numerous volumes and papers, however, we think this book on our native fruits will have for botanists the most abiding interest. —W. L. J.

NEWS NOTES AND CURRENT COMMENT.

Mr. A. A. Heller, of Lancaster, Pa., will start for Porto Rico about January 1. He expects to make a large collection of plants, including all classes, from fungi to flowering plants.

Dr. E. B. Copeland, of the State Normal School, Chico, California, has, according to the *Botanical Gazette*, been appointed Instructor in Botany in the University of West Virginia.

Part 21 of *Pittonia* is devoted entirely to the publication of diagnoses and of segregates. The genera Gutierrezia, Xanthium, Viola, Caltha, Antennaria, Mertensia, Lappula, figure largely in these pages as recipients of new species, besides many others in a less degree. [Payot, Upham & Co., San Francisco. 50 cents.]

In the fifteenth annual report of the Bureau of Animal Industry U. S. Department of Agriculture, Mr. V. K. Chesnut, in a "Preliminary Catalogue of Plants Poisonous to Stock," lists 128 species of the United States flora known to be or suspected of being poisonous to animals. Delphinium recurvatum Greene falls in the category of "probably poisonous," but ranchmen of the southern Coast Ranges are said to insist on its virulence. The California Rhododendron is cited as poisonous, and of Sarcobatus vermiculatus Mr. Chesnut says that a correspondent counted as many as 1,000 sheep that had been killed by eating the leaves of this plant in New Mexico.

The Gardener's Chronicle, of London, in a recent editorial, laments the imperfect equipment of the students sent to India as foresters and as physicians, and attributes the lack of preparation to the neglect in recent years of the study of morphology and classification; in other words, what is often termed "systematic botany." While botany as taught in the olden time was one of the most unpopular items in the medical curriculum, nevertheless, in spite of deficient methods, many did acquire a working knowledge which was most useful to them in after life. The labors of the botanists of India, almost all of whom learned their botany on the benches of the medical schools, has been as remarkable for practical consequences and direct benefit to mankind as for influence in the extension of knowledge. While vegetable histology is of great importance, the editorial writer insists in the first place on the necessity of a wider and more comprehensive knowledge than familiarity with the details of the cell and the making of beautiful preparations.

During the current year Dr. Wiegand, of Cornell University, has published, in the *Bulletin of the Torrey Club*, a useful revision of Listera (26:157) and another of the species of Bidens found in the United States and Canada (26:399). He credits to California Listera convallarioides and also L. cordata. The practise of citing a Pacific Coast locality as "California" or "Oregon" is one constantly indulged in by contributors to the *Torrey Bulletin*. Dr. Wiegand in some cases cites the exact locality or county, which it is desirable should always be done, particularly in the case of a plant so rare in California as Listera cordata. Of Bidens, four species are attributed to California, namely, B. frondosa, cernua, lævis, and Nashii.

An experiment of considerable importance to progress on the material side of botany is to be made by Secretary Wilson, of the Department of Agriculture. Graduates of the land-grant colleges who are taking up special lines of research and who, by the publication of theses or papers, have demonstrated their fitness, may be appointed "Scientific Aids to the Department of Agriculture." These Aids will be paid $40 per month, and the nature of their duties will be such that the positions will be practically the equiva-

lents of fellowships in the colleges. One such position is now open, and the successful candidate will be given ample opportunity to avail himself of the facilities for investigation, and will be privileged to use the libraries, laboratories, and museums of the U. S. Government.

RECENT botanical papers in the proceedings of the California Academy of Sciences have been issued as follows:—

November 17, 1898, Some Observations on the Development of the Karyokinetic Spindle in the Pollen-Mother-Cells of Cobæa scandens Cav., by Anstruther A. Lawson; April 15, 1899, The Origin of the Karyokinetic Spindle in Passiflora cœrulea Linn., by Clara L. Williams; June 5, 1898, The Nature of the Association of Alga and Fungus in Lichens, by George James Pierce; July 8, 1899, Californian Hypogæous Fungi, by H. W. Harkness; July 21, 1899, Studies on the Flower and Embryo of Sparganium, by Douglas Houghton Campbell.

AS A RESULT of studious and prolonged researches upon the liverworts of California, Dr. M. A. Howe has presented to us a scholarly account of "The Hepaticæ and Anthocerotes of California," forming volume VII of the Memoirs of the Torrey Botanical Club. The diagnoses of the species are full, to the extent sometimes of being elaborate, are accompanied by critical notes and comparisons, and also by descriptions of the genera, families, and classes. One hundred and twenty-two excellent plates illustrate species hitherto not at all or only imperfectly figured, and a comparative table shows the relation of our hepatic flora to that of other northern regions of the earth. The number of species listed for California is 86—representing 36 genera—but Dr. Howe hazards the prophecy that explorations of the future, particularly of the Sierras in the spring months, will nearly double the number of species now known.

WE HAVE just received a copy of Prof. Conway MacMillan's "Minnesota Plant Life," which is primarily a product of the author's excursions, during twelve years, among the woods, lakes, and rivers and over the prairies of Minnesota. It is not intended

as a book for the schools, and yet it will, without question, be widely read and used in the schools and also by the general public of that state. It has been the author's object to present the plant world as an assemblage of living things, to include in review all forms of plants, to explain some plant structures in relation to surrounding nature, to bring before the reader the life problems of certain plants and plant societies;—ends which he has very successfully attained. The illustrations are numerous and some are very beautiful. Typographically as well, the volume is a handsome one, and is a credit to a state which has the reputation of being very generous to its Department of Botany, particularly in the matter of publication.

Notwithstanding the number and diversity of elementary botanical text-books which have been produced in the last four years, it happens, nevertheless, that the teacher in the secondary schools is often in as many pedagogical difficulties as ever about the teaching of botany or some phase of it. Now comes Prof. W. F. Ganong with a new book, entitled "The Teaching Botanist, a manual of information upon botanical instruction, together with outlines and directions for a comprehensive elementary course," which should prove a most practical aid, and something of an inspiration besides, to high-school teachers. [MacMillan & Co., New York, $1.10.]

The Editor of this journal announces that Erythea will be discontinued with the completion of the present volume. No. 12, Part 2, of Volume VII, completing this (December, 1899) number, will contain one or two remaining articles, Erythea L'Envoi, and the title-page and index to the current volume. This part will be ready within two months, or as soon thereafter as is possible. Subscribers should not bind their copies of Volume VII until they receive No. 12, Part 2.

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ERYTHEA

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EDITED BY

WILLIS LINN JEPSON,

Assistant Professor of Botany, University of California.

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The Publication of ERYTHEA will be discontinued with the completion of the present volume. No. 12, Pt. 2, containing the remaining pages of the volume, the title-page and index, will be ready for distribution within a few months. Subscribers failing to receive this part before June 1, 1900, should address us to that effect.

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ERYTHEA,

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NEW SPECIES, PRINCIPALLY FROM MARIPOSA COUNTY, CALIFORNIA.

BY J. W. CONGDON.

Sidalcea favosa. Perennial. Plant slender, decidedly hirsute. Stems usually simple, often decumbent at base, somewhat leafy, spicate at summit. Radical leaves orbicular, 1 in. in diameter, with 10 or more shallow rounded lobes, often hardly more than crenate, on petioles 3 to 5 in. long. Stem leaves smaller, more deeply lobed, on petioles longer than themselves. Flowers purple, hardly more than $\frac{1}{2}$ in. in diameter. Calyx-tube shortly turbinate, the longer teeth ovate-lanceolate to linear-lanceolate varying even to linear, tapering to a long point. Fruit strongly favose.

Not rare in the high meadows of the central Sierra.

Sidalcea montana. Perennial. Plant with a very close short stellate pubescence but not hirsute or hispid. Stems slender, 1 to 2 feet high, nearly or quite erect, with very slender loosely spicate branches. Leaves $\frac{1}{2}$ to $\frac{3}{4}$ in. in diameter, all divided to the base into 3 to 5 cuneiform lobes which are entire or crenately toothed but hardly lobed. Petioles longer than the leaves. Calyx-tube shortly turbinate, with narrowly lanceolate, sharply tapering teeth twice as long as the tube. Corolla about $\frac{3}{4}$ in. in diameter, pink purple. Carpels few, reticulate, each forming a regular section of a flattened globular head, with the back rounded and deeply grooved, tipped with a slender beak-like point.

In granite sand, in the high Sierras east of the Minarets, at 11,000 feet.

Ribes Mariposanum. A straggling shrub, 3 to 5 feet high, with long, slender branches, which have few prickles. Leaves about 1 in. in diameter, moderately 3 to 5 lobed, thin; their under surface as well as the young shoots softly pubescent. Flowers very large, $\frac{3}{4}$ in. in diameter and fully 1 in. long, usually in pairs at the bracted summit of a stout erect or ascending (rarely pendant) peduncle $1\frac{1}{2}$ to 2 in. long. Floral characters otherwise much as in

R. Menziesii. Ovary densely glandular but not prickly. Fruit not prickly, yellowish when ripe, with a thick, tough, shagreen-like skin, which is strongly glandular and gives a nauseous taste to the otherwise sweetish and edible pulp.

Flowers May 15 to June 1, and the fruit ripens in September. This species is limited to the coniferous belt in the mountains between 3,500 and 5,000 ft. It is reported as abundant in the Sierras further south, and its nauseous fruit is well known to the mountaineers.

Epilobium concinnum. Perennial. Plant, except above, almost completely glabrous, above usually more or less glandular-pubescent, stoutish, erect, simple or with a few slender branches. Leaves mostly alternate, closely sessile, thin, green both sides, oblong or oblong-lanceolate, tapering to a more or less abrupt almost obtuse apex, with cartilaginous edges which have minute, regular, almost glandular denticulations; the principal veins of a brownish color, very large and strongly marked. Flowers rather small, sessile towards the top of the stem and branches, usually of a bright coral red, but sometimes paler. Pods slender, strictly erect. Seeds smoothish, oblong-obovoid, at the free end tapering to a point, with one side hollowed out and boat-shaped, with a strong central ridge in the hollow.

A very pretty species with delicate foliage, marked by the bunched bright red flowers which expand into spikes in fruit. Wet places, 6,000 to 7,000 ft., on trail to the Soda Springs of the San Joaquin.

Echinocystis horrida. Stem often low and trailing but also climbing high, but never very stout. Plant nearly or quite glabrous. Leaves thin, rather small for the genus, angulate-lobed usually with 5 oblong or oval lobes. Flower clusters with very slender branches. Corollas campanulate, rather small for the genus. Fruit very large, oblong or oval, 3 to 6 in. long, armed with very strong and numerous 1 to 2 in. long spines, usually 4-celled. Seeds about 4 in a cell, oblong obovoid, 1 in. long, the smaller end compressed, the larger perfectly terete.

This apparently distinct species is the most common one in the foot-hills of Mariposa County, but its fruit is very scarce. It is

abundantly different from our other species, E. fabacea var. campestris, which ascends from the plains only a short distance into the foot-hills. It differs from the macrocarpa of Greene in the campanulate corolla and in the shape of the seeds.

Selinum validum. Plant stout, tall, usually strongly pubescent in all its parts. Stems 3 to 6 ft. high, leafy. Leaves biternately or bipinnately divided, usually broadly ovate in outline, sometimes nearly a foot in diameter; the ultimate leaflets usually ovate, serrate, usually acuminate, 1 to 2 ft. long. Fruit and inflorescence about the same as in S. capitellatum Benth & Hook.

The present species, S. capitellatum and S. eryngifolium Drew, are three closely allied and perhaps confluent forms. Their inflorescence and fruit are almost identical, but they differ greatly in foliage and in general appearance. S. capitellatum is often nearly or quite glabrous, with rather slender few-leaved stems, long peduncled umbels; the leaves long-petioled, pinnately or bipinnately divided; the ultimate leaflets narrowly-oblong to lanceolate. It is in our region mostly confined to the east side of the main Sierra. S. eryngifolium has a more condensed growth with leafy stems and shorter-peduncled heads; the leaves bipinnately dissected into oblong or lanceolate very acute or mucronate ultimate segments only $\frac{1}{4}$ to $\frac{1}{2}$ in. long. It grows for the most part in the high mountains at 8,000 to 11,000 ft. S. validum differs in the particulars named above and belongs to the western slope of the mountains descending with the streams to the foot-hills. It is particularly abundant near Wawona.

Erigeron Mariposanus. Perennial, with slender, more or less decumbent stems, 6 to 10 in. high, from slender, running rootstocks. Plant strongly but rather sparsely setose-hispid, the bristles often with pustulate base. Leaves 1 to $1\frac{1}{2}$ in. long, narrowly obovoid-oblong, varying to oblong or above even to linear-filiform, entire, veiny, sessile or tapering to a very short petiole, with a strong midvein, either abruptly acute or obtusish at apex. Heads solitary or 2 to 5 in a loosely branching corymb, $\frac{1}{2}$ to $\frac{3}{4}$ in. in diameter. Involucre of about three series of linear appressed, almost strigosely pubescent bracts, externally herbaceous. Rays 15 to 30, rather broad, pink to whitish. Pappus simple, strongly scabrous under a ens. Achenes sparingly hirsute, flattened.

A species confounded with E. foliosus but differing widely from any California form known to me. Hillsides, Mariposa, July.

Wyethia foliosa. Stems usually several from the same root, ascending but not erect, 2 to 3 ft. high, stoutish, leafy, often with 2 or 3 heads. Leaves light green, lanceolate to oblong or even ovate-lanceolate, entire, but with somewhat undulate margins, pubescent with a very short, closely appressed pubescence; the radical 6 to 12 in. long, tapering at base to a margined petiole; the cauline several, 3 to 5 in. long, nearly or quite sessile. Heads 1 to 1½ in. in diameter, or rather long naked peduncles. Involucre of about three series of nearly equal oblong-lanceolate to ovate-lanceolate, appressed, green but not leafy bracts. Rays 10 to 15, 1 to 1½ in. long. Achenes with sharply laciniate pappus, nearly half as long as the achene itself, and 1 to 3 stout scabrous awns.

This species is nearest W. angustifolia and is the plant referred to by Gray in his note to the description of the latter species in the Botany of California. It differs from that plant in its taller, stouter, more leafy, often branching stem, its less hirsute and more appressed pubescence, its shorter, less foliaceous and closely appressed involucre. It belongs to the wooded slopes of the Sierras, ranging from 3,000 to 8,000 ft.

Cnicus Tioganus. Acaulescent. Plant grayish green, with mostly appressed pubescence. Leaves in a stiff radical cluster, elongated-oblong in outline, 4 to 8 in. long, strongly and laciniately pinnatifid and prickly; the upper and lower surfaces alike. Heads 1 to 3, closely sessile, strongly leafy bracted, whitish or cream-colored, 1 to 1½ in. in diameter. Inner bracts not prickly.

This peculiar acaulescent form grows frequently in the Mt. Dana region from the Tioga mine to Mono Pass. It seems nearest to C. foliosus, Gray. The acaulescent form of C. Drummondii, which grows sparingly in the same region, differs in its purple, smaller heads, its thin deep-green, scarcely prickly or laciniate leaves, which are whitish underneath.

Gilia diffusa. Section Eugilia. Annual. Stems more or less glandular-pubescent above, very diffusely branching with very slender filiform branches, 6 to 10 inches high. Leaves very finely pinnately or bipinnately dissected, with filiform segments. Pedi-

cels very slender, divaricate, mostly much longer than the flowers. Calyx-tube cylindrical, scarious but marked with green lines corresponding to the linear-subulate teeth, which are nearly as long as the tube. Corolla funnel-form, 2 to 3 in. long, varying in age to almost salver-form, purplish blue with a yellow throat. Stamens shorter than the corolla lobes. Seeds developing spiracles when wetted.

New Coulterville Road, Mariposa Co., April.

Collinsia inconspicua. Annual. Stems slender, with few, nearly erect branches, rough with short, stiff pubescene, 6 to 12 in. high. Leaves less pubescent, often nearly glabrous, lanceolate or oblong-lanceolate to linear, thickish in texture, paler beneath; the upper usually entire, the lower crenately toothed, all petioled. Flowers shortly pedicellate; the pedicels in fruit $\frac{1}{4}$ to $\frac{1}{3}$ in. in length, axillary, single below, above in axillary whorls of about 6 flowers, the leaves reduced to narrow bracts. Calyx-tube ovoid-globular, with stout, setaceous, rough-pubescent, long, tapering teeth which are longer than the tube. Corolla $\frac{1}{6}$ to $\frac{1}{3}$ in. long, strongly bilabiate, white with brown-purple spots. Ovary globular, smooth, slightly projecting from the calyx-tube.

Occasional in the woods of the coniferous belt.

Mimulus coccineus. Annual. Stem usually condensed into a radical tuft which sends down a long, slender thread of a root into the sand. (In moist soils a short but real stem develops.) Herbage with a very short, close, glandular pubescence. Leaves oblong-lanceolate to ovate-lanceolate, obtusish, thin, $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Flowers few, axillary, large for the size of the plant. Calyx short-cylindrical, not inflated, slightly plicate-angled, with linear teeth nearly or quite as long as the tube. Corolla at first almost scarlet, turning darker with age, with a tube nearly 1 in. long, very slender below, above gradually expanding into a funnel-form throat, with a widely expanded almost regular limb.

A very pretty species growing in the granite sand in or near the mountain-tops of the Sierras, east of the Minarets, August.

Mimulus viscidus. Annual, erect or nearly so with, unless depauperate, slender spreading branches. Plant strongly viscid-pubescent and glandular, 1 to 9 in. high. Leaves oblong-obovate,

varying to oblong or ovate-lanceolate, veiny. Flowers short-pedicellate, in the forks and axillary along the branches. Calyx ovoid, strongly plicate-angled in the manner of M. subsecundus, somewhat oblique, with acutely triangular, nearly equal teeth. Corolla 1 in. long, with a slender, deeply crimson or purple tube, hardly any throat, with an abruptly and widely expanded, whitish or pale pink limb. Capsule oblong-linear, loosely invested by, and not longer than the inflated, plicate-angled calyx.

This is nearest in structure to M. subsecundus Gray, but differs in its substantially erect growth, larger, paler, and parti-colored more showy flowers. Among the chemisal in the lower foot-hills, May, June.

Castilleia montana. Perennial. Plant with a short, harsh, not hirsute pubescence, varying to nearly glabrous. Stem slender, leafy, strictly erect, 2 to 4 ft. high, simple or with a few, divaricately spreading, slender, strict branches, the stem and branches terminating in short, dense spikes in flower 1 to 2 in. long, but which lengthen in fruit to 3 to 4 in. Leaves 1 to 1½ in. long, oblong-lanceolate to ovate-lanceolate, long-acuminate, entire, thin, strictly sessile. Flowers all sessile, bright red, showy. Calyx deeper cleft before than behind, with two oblong divisions each deeply parted into two long, linear-subulate lobes. Bracts similarly lobed. Corolla very slender, arcuate, 1 to 1½ in. long, the upper lip as long as the tube, the lower lip almost as short as in C. miniata.

This has been confused with C. affinis, a plant of the coast, while this belongs to the high Sierras at 4,000 to 6,000 ft. and is strikingly marked by its slender divaricate branches, shorter, more compact, more showy spikes. Wawona and Yosemite region generally, July, August.

Orthocarpus Mariposanus. Subgenus Triphysaria. Plant more or less hirsute, almost shaggy above. Stems slender, erect, mostly simple, 3 to 9 inches high. Leaves and bracts pinnately divided into long setaceous divisions. Flowers in short, compact, 1 in. high heads which become looser and somewhat elongated in fruit. Bracts with the lobes nearly as long as the flowers, with enlarged whitish or purplish tips. Calyx-teeth setaceous, longer

than the tube, with like colored tips. Corolla yellowish white varying to nearly yellow, especially the sacs, nearly twice as long as the calyx-teeth, the tube ½ to ¾ in. long, slender, the sacs very protuberant, usually fully as deep as long; upper lip short, erect, triangular, scarcely longer than the three erect, oblong or oval teeth of the lower lip. Stamens all with 2-celled anthers, the longer and stouter pair included in and not much shorter than the upper lip. Style smooth. Stigma globular, sometimes slightly 2-lobed. Capsule ovoid, glabrous, filling the calyx-tube. Seeds irregularly flattened and wrinkled with loose seed coat.

This species differs from most of the species of Triphysaria in the heads rather than spikes, showy with the colored tips of the bracts and calyx-teeth. Grassy places in the foot-hills. March to May.

Mariposa, California.

SHORT ARTICLES.

Sebastiana (?) bilocularis, Wats. This species of northwestern Mexico, described by Dr. Watson (Proc. Am. Acad. xx. 374) from Sonoran specimens of Thurber and Pringle, has recently been discovered at Gila Bend in Arizona by Dr. H. E. Hasse, who has thus added a plant of more than usual interest to the arborescent flora of the United States. The specimen observed at Gila Bend (of which some flowering and fruiting branches have been sent to the Gray Herbarium) was an isolated individual growing on a desert mesa; but Dr. Hasse writes, that he has been told by persons familiar with the region, that the plant is not uncommon in the Dragoon and Huachuca Mountains. It is the "palo fleche" or "yerba de fleche," with which the Apache-Indians are said to have poisoned their arrows.—B. L. Robinson.

Correction in Aragallus.—Since the publication of my paper on *Aragallus* in the June number of Erythea, I find that there is an *Oxytropis albiflora* Bunge. As this may sometimes be trans-

ferred to *Aragallus* it becomes necessary, much to my regret, to make the following changes:—

Aragallus saximontanus. *A. albiflorus*, Aven Nelson, ERYTHEA, 7: 62.

Aragallus saximontanus condensatus. *A. albiflorus condensatus*, Aven Nelson, ERYTHEA, 7: 63.

AVEN NELSON.

University of Wyoming,
Laramie.

NEWS NOTES AND CURRENT COMMENT.

THE president and fellows of Harvard University have recently appointed Dr. B. L. Robinson, Curator of the Gray Herbarium, to be Asa Gray Professor of Systematic Botany. This professorship, founded by an anonymous patron of Harvard, is connected with the position of Curator of the Gray Herbarium.

PART 22 of Professor Greene's *Pittonia* contains descriptions of a large number of new species, chiefly from the Rocky Mountain region. [Payot, Upham & Co., S. F.]

ENVOY.

With this number is completed the seventh volume of Erythea, and with this volume the existence of the Journal terminates. Erythea has been to us a happy name. The care and devotion attending its monthly editing, the financial responsibility necessary to its regular publication, has in no case been a heavy care, a trying devotion, or a burdening responsibility.

Here, for seven years, we have lived on the rim of the botanical world, in these isles of the Hesperides, beneath the shade of the Apple Tree. We can not suppose that all the fruit gathered by Erythea has been golden; but it is a pleasing hope that it has all been round and sound, none bitter or exiguous.

Reluctantly, therefore, we faced an issue where the duties involved with the Journal's continuance were inconsistent with other and more insistent demands. For this reason the Journal ceases. Here, however, is opportunity to express our indebtedness to those who have generously and ably, and on many occasions opportunely, arisen to our assistance. Our best thanks are due to Prof. E. L. Greene and Dr. M. A. Howe and for more recent services to Prof. W. A. Setchell, Mr. J. B. Davy, and Miss Alice Eastwood. To these and to other friends at home, and to many correspondents in distant or remote quarters of the earth, we are pleased to send our happy acknowledgments.

Willis L. Jepson.

University of California,

Berkeley, June 20, 1900.

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ERRATA.

Page	12,	line 24,	for	"Berkelayi" read Berkeleyi.
"	12,	" 26,	for	"strobilomyces" read Strobilomyces.
"	84,	" 29,	for	"southern" read Southern.
"	90,	" 11,	for	"5 cm." read 5 mm.
"	91,	" 8,	for	"oblonga" read lingulata.
"	91,	" 9,	for	"lingulata" read oblonga.
"	91,	" 34,	for	"E. Bigelovii" read S. Bigelovii.
"	98,	" 15,	for	"pentstemon" read Pentstemon.
"	109,	" 13,	for	"foliaceus" read foliosus.
"	111,	" 8,	for	"angustiflora" read angustiflora.
"	113,	" 7,	for	"augustifolia" read angustifolia.
"	113,	" 10,	for	"achillæafolia" read achilleæfolia.
"	176,	" 3,	for	"Juamea" read Jaumea.
"	181,	" 24,	for	"one hundred and twenty-two" read Thirty-five.

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